

TEACHER CHARACTERISTICS AND THE ACHIEVEMENT OF STUDENTS WITH
DISABILITIES

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Dedicated to the most important person in my life

Carol Edmonds

whose understanding, sacrifice, and assistance made this possible.

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In today's climate of school accountability, the consequences of failing to meet state and federal requirements are too great to ignore. Schools are under pressure to find ways to make all students successful or face the prospects of increasingly punitive measures. Schools find it especially difficult to be successful with students with disabilities and, in many instances, by the performance of that subgroup fall short of meeting annual goals.

The role of the teacher in the success of students is well documented.

Policymakers and legislators alike recognize the value of the effective teacher and have taken steps to ensure that all students receive instruction in core subjects from highly qualified teachers. That an effective teacher is important appears unquestioned; however, how to predict who will become an effective teacher has not met with the same consensus. Teacher inputs on student achievement such as quality of teacher training institutions attended, amount of training, licensure area and status, and teacher self-efficacy have all been studied. What has not been studied is how these inputs manifest themselves on the performance of students with disabilities on high-stakes tests. This study addresses that gap by examining teacher inputs for 55 special education teachers on the performance of 462 students with disabilities using the Ohio Achievement Test for reading. Results indicate that the quality of the teacher training institution attended by the teacher has a significant effect on student achievement; however, students with cognitive disabilities failed to make progress regardless of teacher characteristics.

These findings have implications for schools of education as they train teachers and school districts as they hire them. Findings also raise questions about the growing

practice of using student performance as an accountability measure for schools, school districts and, increasingly, teachers.

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CHAPTER 1: INTRODUCTION

The past 25 years have seen a rising demand for accountability in America's public schools. The impetus of this demand can be traced back to *A Nation at Risk: The Imperative for Educational Reform* (National Commission on Excellence in Education, 1983), that warned of a "rising tide of mediocrity" in American schools. Since then local school boards and state governments have responded to mounting criticism by instituting a variety of accountability measures (Elmore, Abelman, & Fuhrman, 1996). The most far-reaching accountability measures to date are arguably the ones contained in the No Child Left Behind Act (NCLB) (Linn, Baker, & Betebenner, 2002). NCLB holds schools accountable for the achievement of all students, regardless of race, socioeconomic status, or disability. The NCLB requirement that *all* students reach proficiency by 2014 has changed the status of students with disabilities dramatically and has also changed demands for quality of teaching personnel.

My roles as a special educator, special education administrator, and general education administrator over the past 30 years provided me with the opportunity to personally witness these changes from several vantage points. I was intimately involved in implementing state and local initiatives resulting from changes in education laws and regulations. Although limited to a small geographic area in a single state, I have firsthand experience with the issue of hiring high quality special education teachers and providing an appropriate educational experience for students with disabilities. In an attempt to explore the renewed emphasis on teacher quality, this project examined the achievement of students with disabilities to assess teacher quality.

The Role of Special Education in School Accountability

NCLB has increased the participation of students with disabilities in the general education curriculum to a new level by requiring that students with disabilities not only participate in state accountability testing, but that they also meet the same rigorous state standards as students without disabilities. With the exception of 1% of the student population with severe disabilities for whom alternative assessment is permitted and 2% of the population with *persistent academic disabilities* (U.S. Department of Education, 2005) for whom modified assessment measures are allowed, students with disabilities face the rigors of meeting grade level standards.

Schools across America are scrambling to find ways to meet the Adequate Yearly Progress (AYP) requirements of NCLB and to avoid the consequences of being labeled as a failing school (Gray, 2010). Quite often schools that do not make AYP fall short of the mark in just one of the subgroups on which they are required to report. It is common for that subgroup to be students with disabilities (Aguilar, 2007; N. Anderson, 2006; Matus & Waite, 2004; Stullich, Eisner, & McRary, 2007; Why is your school on this list?," 2006). Consequently, students with disabilities are seen as holding schools back from meeting AYP, and are in danger of becoming the scapegoat for frustrated school leaders when explaining why schools fail (Allbritten, Mainzer, & Ziegler, 2004; De Vise, 2005). This frustration from a lack of test performance comes at a time when the cost of special education services is being blamed for the rising cost of schooling in general (Editorial, 2006; Jordan, 2007). Schools are beginning to question the value of the services being provided for students with disabilities and some are going so far as to reduce services in an effort to save money (Einhorn, 2007; Kosena, 2007). The pressure

to perform and a concern over expenditures put students with disabilities in an unenviable position.

Helping students with disabilities improve their performance on high-stakes tests would prove beneficial in at least two ways. First it would give those students access to aspects of schooling that are increasingly tied to high-stakes testing, such as grade promotion and high school graduation with a standard diploma (Johnson, Thurlow, & Stout, 2007). Second, improved performance on high-stakes tests could prevent schools from the consequences of being labeled as failures and help them to be seen in a better light by students, staff, and the larger community. Increasing the success of students with disabilities on high-stakes tests would relieve some of the pressure on these students, both as individuals and as members of the larger student body. But how can students with disabilities be helped to improve their performance? There are many aspects of an educational program that affect the quality of education for any student. Increasingly, policymakers and school leaders are looking at the quality of the teacher as the solution to improving student achievement.

Teacher Quality and Student Performance

There is a growing body of research on the effect teacher quality has on student achievement. Over forty years ago, the Coleman Report (1966) supported the idea that teacher quality impacted student achievement. The National Commission on Teaching's landmark report, *What Matters Most: Teaching for America's Future* (1996), underscored the role good teaching plays in student performance:

This plan is aimed at ensuring that all communities have teachers with the knowledge and skills they need to teach so that all children can learn and that all

school systems are organized to support teachers in this work. A caring, competent, and qualified teacher for every child is the most important ingredient in education reform and, we believe, the most frequently overlooked. (p. 3)

More recently researchers report that teacher quality is the most important predictor of student performance (Rivkin, Hanushek, & Kain, 2005; Sanders, 1998), and that these positive teacher effects are additive and cumulative (Sanders & Rivers, 1996). It is estimated that having an effective teacher can mean more than one grade level equivalent of growth in a school year (Hanushek, 1992). The lawmakers who crafted NCLB recognized the value of good teaching and included in the act the guarantee of a highly qualified teacher for every core subject offered in America's public schools. This apparently straightforward recommendation hides several more difficult questions. What is it, specifically, that makes a quality teacher? Of individuals new to the field, how can it be determined who will be a quality teacher? Even if consensus were reached as to what quality instruction looks like, how can teachers who will deliver the quality instruction necessary for students with disabilities to succeed in the high-stakes testing environment be identified? Several factors thought to influence the quality of the teacher have been studied.

Teacher Characteristics Thought to Influence Student Learning

Educational programs are typically evaluated through either a process approach, which focuses on the different inputs of the program, or a product approach, which focuses on the outcomes of the educational program (Rossi, Lipsey, & Freeman, 2004). Traditional approaches to program evaluation are largely process oriented due in part to the wide acceptance of process variables as adequate indicators of quality and to the lack

of access to outcome data. However, the assumption that quality inputs will lead to a quality product is losing sway and being replaced by direct examination of the product (student achievement) of teachers (Goldhaber & Anthony, 2004). In today's climate of accountability, educational consumers are not willing to make that assumption and are demanding empirical evidence (Robelen, 2009). Advancements in technology that make the gathering and processing of large amounts of student and teacher data economically feasible also make it possible for educators to provide such empirical evidence. This study used student achievement as the product upon which teacher quality was assessed.

The body of research on the effect of teacher characteristics on student achievement is growing (Croninger, Rice, Rathbun, & Nishio, 2007; Darling-Hammond, 2000; Ehrenberg & Brewer, 1994; Goldhaber, 2007; Goldhaber & Brewer, 1997a, 1998, 2000, 2001; Monk & King, 1994; Nye, Konstantopoulos, & Hedges, 2004; Rivkin, et al., 2005; Sanders & Rivers, 1996), although studies that have concentrated on achievement of students with disabilities remain rare¹. It is increasingly common to find student achievement used as the outcome variable in teacher effectiveness research. An examination of recent literature on teacher effects using student achievement as the outcome variable identified four categories of characteristics that impact student learning (Wayne & Youngs, 2003): quality of teachers' colleges, licensure status, teacher testing, and courses taken. To be included in the review, Wayne and Youngs required that studies account for students' prior achievement and socioeconomic status; however, they had no restrictions on potentially confounding teacher variables such as teaching experience.

¹ Students with disabilities are regularly excluded from analyses of large databases as exemplified in Croninger's analysis of ECLS (2007).

These four characteristics plus teacher ownership of student success and their effect on student achievement are discussed below.

Undergraduate Institution Ratings and Student Achievement

There is a certain fascination with the quality of colleges and the resulting intellectual product found in all professions. There are numerous publications and individuals that rank schools and offer advice, all in an effort to help students identify which schools provide the best preparation for their chosen pursuit. After all, if a school cannot show its superiority to another then how will a student rationalize paying a premium to attend that school?

Studies have been done on the quality of undergraduate teacher education programs using rating systems such as the Barron's Selectivity Scale (Ehrenberg & Brewer, 1994) and the Gourman ratings (Summers & Wolfe, 1975, 1977). Although these scales have drawbacks, they provide a third-party analysis of institutional quality. Studies indicate that general education teachers trained at more selective colleges and universities produce higher achieving students. Similar studies on the quality of undergraduate programs in special education were not found in the literature.

Licensure Status and Student Performance

Teacher licensure is a process employed by state governments to ensure that individuals meet a minimum level of quality before being allowed to teach our students. Some consider this process a gatekeeper, preventing those who are ill prepared from teaching in our schools and as an indicator of quality (Darling-Hammond, 2000; Darling-Hammond, Berry, & Thoreson, 2001). With the current emphasis on the importance of quality teaching, the role of licensing teachers is elevated. Critics of the process question

whether it does an adequate job ensuring that our teachers are of the quality necessary to produce the desired results (Goldhaber & Brewer, 2000, 2001; Hess, 2002).

Even with a licensure process in place, certain circumstances can undermine the purpose of this process. For example, social factors such as teacher shortages can create an atmosphere that leads to the circumvention of established licensure standards. A popular response to teacher shortages is to allow individuals to teach on emergency credentials that often include a bachelor's degree and either minimal or no education coursework (Mikulecky, Shkodriani, & Wilner, 2004). The result is that teachers enter schools with varying levels of formal education. This is not necessarily problematic for those who broadly question the value of professional education programs. Some researchers suggest that the licensure process makes no difference or even produces an inferior product (Goldhaber & Brewer, 2000, 2001; Hess, 2002).

Studies on the value of licensure that link licensure status to student achievement are beginning to appear. For example, Goldhaber and Brewer (1997a, 2000) questioned the value of teacher licensing. Their findings suggest that licensure does make a difference in the content areas of math and science. In interpreting these results, the nature of math and the universality of math curricula are discussed as potential reasons for the apparent connection. Researchers suggest that the link between teacher licensure and student performance is stronger in math than in any of the other content areas, not because of a qualitative difference in the subject of math, but simply because of the uniform nature of math education. These findings suggest that content area as well as the status of a teacher's license may affect student performance.

Teacher Testing and Student Performance

Licensure requirements represent a process approach to screening out undesirable teacher candidates. Direct testing of teacher candidates, on the other hand, is a product approach to ensuring quality teachers. The practice of teacher testing is championed by those who see the licensure process as lacking rigor. The logic applied in the testing of teachers is that an individual must demonstrate competence and cannot be passed along by a teacher training institution. There is a steady increase in the use of teacher examinations as a gatekeeper for entrance into the teaching profession. The United States Department of Education's Fifth Annual Report on the Quality of Teaching (2006a) reveals that 40 states are currently requiring the testing of new teachers and that, of the remaining 10, seven states have set or are in the process of setting passing criteria for examinations. The remaining three states are in the initial stages of test adoption.

The most commonly used examinations for teachers are the National Teacher Examination (NTE) developed and published by the Educational Testing Service (ETS). This series of examinations includes the Praxis I, Praxis II, and Praxis III (Educational Testing Service, 2010). Praxis I is a test designed to assess basic skills and is given as a screener to entrance into teacher education programs. The Praxis II is a series of pedagogy and subject-specific tests designed to assess the teacher candidate after formal education and prior to entering the profession. Praxis III is an authentic assessment of teaching that is typically carried out during a teacher's first year of teaching.

Prior to the Praxis series, the NTE consisted of the Common Examinations and the Teaching Area Examinations. The Common Examinations covered general principles of pedagogy, psychological and social foundations of education, written expression,

social studies, literature, fine art, science, and math. The Teaching Area Examinations was an array of tests designed to measure comprehension of subject matter and teaching methods in 24 areas for elementary and secondary teachers (Quirk, Witten, & Weinberg, 1973).

The literature on the use of teacher licensing examination outcomes as a predictor of student performance is not extensive; however, researchers have found that licensure examinations such as the Texas Examination of Current Administrators and Teachers (Ferguson, 1998), the NTE Common Examinations (Summers & Wolfe, 1975, 1977), and the Praxis I & II (Goldhaber, 2007) have some degree of predictive ability of performance for general education students. This holds true especially for the content area of mathematics (Goldhaber, 2007). The studies that exist do not address teachers of students with disabilities and, thus, the validity of these results for this population is unclear.

Degrees Obtained and Coursework Taken

Some have argued that the more a preservice teacher is exposed to a particular subject area in the form of coursework or degree requirements, the better equipped that person would be to teach that particular subject and the greater the chance that the teacher's students would be high achievers. This line of reasoning has led to the examination of whether such a link exists; the results are mixed. Teachers with a master's degree do not produce better test scores in students than those with a bachelor's, unless the master's degree is in a content area such as math (Goldhaber & Brewer, 1997a, 1997b, 2000). The same was found to exist for teachers with bachelor's degrees only. Teachers with content specific bachelor's degrees tended to produce higher achieving

students (Goldhaber & Brewer, 1998; Rowan, Chiang, & Miller, 1997). The amount of coursework in a subject, regardless of the degree earned, may also have some effect on student achievement (Monk & King, 1994).

Longitudinal studies indicate that teachers with more coursework in math produce students with higher math achievement (Gallagher, et al., 2000; Monk & King, 1994; Rowan, et al., 1997); however, a definitive link between courses taken or degrees conferred and student achievement has not been established in all subject areas. Although teachers with a stronger preparation in the area of math appear to correlate with students who perform better in math, the relationship between teacher preparation and student achievement is mixed for English and history (Goldhaber & Brewer, 1997a). For science, there is some evidence that stronger preparation leads to improved student performance (Goldhaber & Brewer, 1997a, 2000). No studies were found in the literature documenting the relationship between special education preparation and the academic performance of students with disabilities.

Teacher Ownership of Student Success

Teacher characteristics of quality of college attended, licensure status, testing performance, and courses taken are relatively easy to quantify. A characteristic not so easily quantified, though nonetheless important, is that of ownership. Ownership refers to the belief teachers have about the success of their students; teachers having ownership feel a sense of responsibility for their students (Stoll, 1999). Ownership is manifested in a teacher's belief that students have the ability to learn and that the teacher has the ability to facilitate that learning (Bandura, 1997). Teachers with ownership see their students as full partners in the educational process and see them as integral members of the school

community (Hipp, et al., 2003). They view students not as a disconnected commodity to be acted upon by the staff and sent on their way, but as full members of the school community, sharing in the ownership of the school (Swaminathan, 2004). There are three constituencies within a school community that must be connected to achieve ownership: teachers, students, and school leaders (Rouse & Florian, 1996).

Bandura (1986, 1997) discussed at length the theory of self-efficacy, the idea that people who believe they can achieve what they set out to do are generally more effective, and generally more successful than those who do not. This notion is fundamental to the concept of ownership. Specifically, teachers who believe they can make a difference in the lives of students tend to make that difference. Owning a challenge involves recognizing that one has the responsibility and the wherewithal to handle the challenge. The impact of collective teacher efficacy on student achievement on high-stakes tests has been shown to be significant (Tschannen-Moran & Barr, 2004). Because teacher behaviors may influence student achievement, it has been argued that teachers should be encouraged to accept responsibility for student achievement (Stoll, 1999). Promoting collective responsibility on the parts of teachers and students is one way of building the internal capacity necessary for school improvement.

Developing a sense of belonging in students is another critical aspect of ownership. Students need to feel a shared responsibility for school and need to be made partners in the process of school success (Hipp, et al., 2003). Students should be accepted as part owners in the success of schools. They need to feel that the school is owned by students and staff alike and not just a place owned by adults (Swaminathan, 2004). Crucially, this sense of belonging should not be restricted to students in general

education; students with disabilities also need to experience a sense of connection and belonging to a school. Such a connection may be made through relationships with adults and other students (Brigharm, Morocco, Clay, & Zigmond, 2006).

Finally, the role of leadership in fostering ownership of student success is extremely important (Rouse & Florian, 1996). For students with disabilities, effective inclusion schools are those with a common mission, an emphasis on learning, and a climate conducive to learning. To achieve this, teachers, students, and school leaders all must be involved (Brownell & Pajares, 1996; Hipp, et al., 2003; Stoll, 1999).

Purpose of the Study

The definition of effective teaching in the present educational environment includes observable results at the student level. No longer will a purely process oriented approach to defining teacher quality suffice. Governmental and consumer demands for accountability have led to a product oriented approach to assessing teacher effectiveness, and how students perform on high-stakes tests is now an integral part of determining teacher effectiveness. However, the current literature using student performance on high-stakes tests as an outcome measure to gauge teacher effectiveness is conducted almost entirely on the general education population. It is likely that the large datasets used for this research include students with disabilities, but no studies focused solely on students with disabilities, or on teachers trained specifically to educate them could be found. In fact, several of the studies report specifically excluding students with disabilities (Croninger, et al., 2007; Darling-Hammond, Holtzman, Gatlin, & Heilig, 2005; Rivkin, et al., 2005; Rockoff, Jacob, Kane, & Staiger, 2008). Now that students with disabilities are part of the accountability measures with which schools are confronted, it is all the more

important to conduct research concentrating exclusively on this population in research on teacher effectiveness. This study used some of the same theory of effective teaching currently applied to general education teachers in a study consecrated to special education teachers.

The purpose of this study was to assess the influence of various special education teacher characteristics on the achievement of students with disabilities. The findings have implications for teacher training institutions as they design programs for teachers of students with disabilities and for school administrators as they recruit and hire teachers. Further, there are implications for the broad policy of including all students with disabilities in high-stakes testing programs.

Research Questions

Teacher characteristics examined in this study include the quality of the teacher training program attended, the number of special education courses taken, licensure status, licensure area, and the degree of teacher self-efficacy. Scores on teacher licensing exams (the NTE and Praxis II) were to be included in the study; however, difficulty in obtaining a sufficient number of scores led to the elimination of this aspect from the study. The setting for the study was a collection of eight public school districts in west central Ohio. Linear mixed modeling was used to determine the degree to which each of these factors influenced the achievement of students with disabilities on the statewide high-stakes achievement test.

Two fundamental questions drove this research. First, do the teacher characteristics of college attended, special education coursework, license status, license area, and teacher self-efficacy predict a student with a disability's achievement on high-

stakes tests? Delving deeper, the study reports the proportion of the variance in student scores that can be attributed to these factors and the interaction of the factors.

The second question in this study examined how well the findings can be generalized to all students with disabilities. The interaction between a student's disability and teacher characteristics was analyzed and reported. Concerns about the differential effect of teacher quality on student outcomes affected by disability type are addressed in the discussion.

From the results obtained two models for the prediction of student gain scores are offered. A full model containing all teacher and student variables is analyzed. As a result of the analysis, a final, parsimonious, model is presented. The possibility of creating an effective teacher profile for disability education is explored.

CHAPTER 2: A REVIEW OF THE LITERATURE

This study is ultimately about student achievement and improving outcomes for students with disabilities in an educational environment focused on high-stakes tests as outcome measures. Student achievement can be thought of as an equation: factors on the left side of the equation combine to produce student outcomes on the right side of the equation. On the left side are the student component and the educational environment component. These two factors are further subdivided into variables unique to each child and to each educational setting. The unique interaction of these variables results in what is known as achievement. This study investigated the teacher component of the left side of this proposed equation in an effort to better predict the right side—student achievement.

The variables belonging to the student component of the achievement equation are, by nature, largely unregulated. Schools have little influence on what the student brings to the school environment. However, substantial influence on the school component is exercised. School boards build state-of-the-art buildings, purchase the latest curricular materials, and search for the best people to staff our schools. Although all of these aspects contribute to the school component, many have argued that the most important variable in the school component is personnel; the largest portion of our school budgets is spent on personnel and our government regulates everyone who works in our schools, from volunteers to the superintendent of schools. The teacher workforce is perhaps the most closely regulated portion of the school environment. Thus, this study will focus on the impact of teachers on student achievement.

Some of the more salient student variables that affect school achievement include the student's socioeconomic status (SES) (Chatterji, 2006; Dahl & Lochner, 2005; Gershoff, 2003; Tate, 1997; Terwilliger & Magnuson, 2005), ethnicity (Baer, Baldi, Ayotte, & Green, 2007; Campbell, Hombo, & Mazzeo, 2000; Lee, 2002; Lubienski & Shelley, 2003; Snipes, Williams, Horwitz, Soga, & Casserly, 2007), gender (Casey, Nuttall, & Pezaris, 2001; Gallagher, et al., 2000; Klecker, 2006; Lachance & Mazzocco, 2006; Marshall & Smith, 1987; Mau & Lynn, 2000; Ready, Logerfo, Burkam, & Lee, 2005; Viadero, 2006; Wiens, 2005), and disability (Browder, et al., 2005; Hallahan & Mercer, 2001; Hallahan & Mock, 2003; U.S. Department of Education, 2006b; Wheldall, 1994). These variables have been the focus of a plethora of educational research and need to be considered in any study on student achievement. Likewise, there are several teacher variables that merit attention. The variables that serve as regulators or gatekeepers of the profession include the degree of rigor imposed by a teacher's training institution, the type and attainment of a standard teaching license, scores on examinations required for entrance into the teaching profession, and the amount of professional education coursework taken. An additional variable that has received much attention in the educational literature on teacher effectiveness is that of teaching experience. Finally, a variable of particular interest in this study was that of teacher self-efficacy.

This chapter will examine the literature on each of these variables. The first section will discuss the relationship of teacher variables to student achievement, paying special attention to the ownership of student achievement. The second section explores student variables, including gender, disability, SES and ethnicity.

Teacher Variables

Teachers bring unique variables to the educational setting. Schools of Education train prospective teachers on standard approaches to teaching in an attempt to standardize the delivery of instruction and ensure a prescribed level of quality for the teaching profession. Specific courses are required for obtaining a teaching degree. States also regulate the quality of the profession by demanding credentials and specifying passage rates on teacher qualifying exams. Performance on each one of these variables may affect student achievement and each will be discussed in turn.

A wide variety of teacher characteristics have been examined for their influence on student achievement. Five such characteristics are examined here including three of the four categories of teacher characteristics (quality of teachers' colleges, licensure status, teacher testing, and courses taken) identified by Wayne and Youngs (2003); teaching experience; and teacher self-efficacy.

Undergraduate Institution Ratings

A study of the relationship between the levels of quality of the college a teacher attends and the progress that teacher's students make warrants a discussion on the definition of quality. Harvey and Green (1993) proposed five conceptualizations of quality of institutions of higher education (IHE) and concluded that, in the end, there is no single *correct* definition of quality. Rather, the definition of quality is relative to the stakeholder. Three of their conceptualizations relate to college selectivity and will be discussed.

Harvey and Green (1993) posited that the traditional concept of quality carries the connotation of being *exceptional*. They suggest that exclusivity or distinctiveness is an

attribute of quality. This concept aligns well with the notion of college admission selectivity used in the Wayne and Youngs (2003) study. This singular conceptualization appears to be a reliable indicator when it comes to identifying IHE quality.

A second conceptualization of quality is that of *value for money*, or getting one's money's worth. In other words, are the benefits worth the price of the education? Several economists have studied the relationship between the relative cost of a college education and the financial benefits. Using income after graduation as the outcome variable, they found that the additional cost of an elite private school is worth the price (Brewer, Eide, & Ehrenberg, 1999; Fox, 1993) and that, in general, students graduating from more selective schools have higher earnings upon graduation (Dale & Krueger, 2002; Thomas, 2003).

Fitness for purpose is a third conceptualization of quality Harvey and Green (1993) applied to IHEs. They suggest that if the purpose of a college is to educate students, which is manifested by granting degrees, then graduation rate can be construed as an indicator of quality. This functional definition of quality is also related to selectivity; more selective schools have higher graduation rates (Melguizo, 2008). And this finding is not just an artifact of having better students, more selective schools graduate similar students at higher rates (Hess, Schneider, Carey, & Kelly, 2009). Minorities also have higher graduation rates at more selective schools (Alon & Tienda, 2005). These three conceptions of quality relate to and support a school's admission selectivity as an indicator of quality.

Three studies were found that examined student achievement as a function of the quality of the institution attended by the teacher. Summers and Wolfe (1975, 1977)

examined the effect of the quality of teacher training institutions as measured by the Gourman ratings on the achievement of students in Philadelphia. The Gourman Report used a scale of 200-800 to provide an institutional rating for over 1100 IHEs on qualities such as student-faculty ratios, technology accessibility, salaries, and faculty morale (McCracken, 1972). The study took place in 1970-1971 and, in contrast to other research of this type, the authors used data specific to each student instead of using school averages. Basing their analysis on test results in grades 6, 8, and 12, the authors were able to observe gains over time. Specifically, Summers and Wolfe found a positive relationship between Gourman's college ratings and the sixth-grade composite achievement score and the eighth-grade social studies scores. No relationship was found for the 12th-grade scores. The authors concluded that, for some students, teachers from colleges with higher ratings are more effective. They found this especially true for low-income students.

Ehrenberg and Brewer (1994) used the High School and Beyond dataset to follow a cohort of students from 10th grade through the 12th grade. Using a composite score in math, reading, and vocabulary, the researchers compared the teachers' institutions as rated by Barron's selectivity rating system to the level of student achievement. Barron's *Profiles of American Colleges* is an annual publication that categorizes IHEs by the degree of selectivity of their admission standards. The ratings are based on entrance examination scores (e.g. ACT and SAT) and high school GPA. The authors did separate analyses on each of the ethnic groups and found that white and black students performed better with teachers from more selective universities. This led the authors to conclude that individual teacher characteristics do make a difference in student gains. Ehrenberg and

Brewer went on to suggest that, using IHE selectivity as a proxy for verbal intelligence, their work supports the literature suggesting a link between teacher verbal ability and student performance.

Rockoff, Jacob, Kane, and Staiger (2008) studied the relationship between student achievement and characteristics of new math teachers in the New York City school system. They gathered data from 602 teachers in grades 4-8 with no prior experience by reviewing their personnel records and administering an extensive survey. They included a variety of traditional and nontraditional teacher characteristics in their study, including items such as data on specific content knowledge, cognitive ability, personality traits, teaching self-efficacy, certification, Barron's college selectivity rating, and scores on a teacher selection instrument. Although they found these traits to be stronger predictors of student achievement when clustered into groups of cognitive and noncognitive skills, they also found a significant effect for the individual trait of selectivity of the teacher's undergraduate institution.

The literature is silent on the role college selectivity plays in the performance of students with disabilities. If students in the general education program benefit from teachers who attend more selective colleges, then it follows that so, too, would students with disabilities. Given the needs of these students, it is arguable that they may benefit even more than others.

Licensure Status and Area of Certification

In a comprehensive review of factors that influence student achievement, Darling-Hammond (2000) concluded that teacher preparation and certification are by far the strongest correlates of student achievement in reading and mathematics. Specifically, she

found the percentage of teachers with subject-specific licensure and the percentage of teachers with licensure vs. those without were predictors of student achievement.

Darling-Hammond triangulated data from a 50-state survey of policies, state case study analyses, the 1993-94 Schools and Staffing Surveys (SASS), and the National Assessment of Educational Progress (NAEP), to reach these conclusions. Despite the findings of this national study, the relationship between student achievement and teacher licensure is mixed.

At the secondary level, Goldhaber and Brewer (1997a, 2000) have done extensive research on the effects of teacher characteristics on student achievement. Specifically, they have examined the characteristic of licensure status. In a 1997 study using the NELS:88 data, the gains of 5,149 students from the grade 8 to grade 10 in the content areas of math, science, English, and history were compared with the certification status of their teachers. Although the English and history results were inconclusive, they found that students had higher gains in math and science when their teachers had standard certification in their respective content areas.

Goldhaber and Brewer (2000) also used the NELS: 88 dataset to examine the gains of students from grades 10 to grade 12 in math and science. They found that students with teachers holding standard math certification outperformed students whose teachers either did not have a math license or had a private school math license.

Hawk, Coble and Swanson (1985) also studied the effect of mathematics certification on the achievement of secondary students. Using a paired comparison design, they studied 18 teachers licensed in math and 18 without a license. Teachers were matched by the school in which they taught, the courses they were teaching and their

students' ability. They found a positive predictive relationship between teacher licensure in math and student performance, leading them to conclude that teacher certification does matter when it comes to student performance.

Studies at the elementary level have not been as conclusive. Rowan, Correnti, and Miller (2002) studied survey data from *Prospects: The Congressionally Mandated Study of Educational Opportunity* to examine the effect of teacher characteristics on math and reading achievement of elementary students. After controlling for home and social background factors, they found no evidence that teacher certification had an impact on student achievement. Similarly, Croninger et al. (2007) found no relationship between teacher licensure and student achievement for first grade students in the Early Childhood Longitudinal Study-Kindergarten Class (ECLS-K) data base. Conversely, Palardy and Rumberger (2008) found that first graders made greater gains in reading achievement when taught by a fully credentialed teacher; however, they found no such relationship for math achievement.

In addition to studies on how subject-specific licensure relates to student achievement, attention has also been given to the differential effect of teachers who have become licensed through an alternative preparation program. Darling-Hammond (1990) examined studies on alternative licensure and concluded that “students taught by fully prepared teachers learn more than students taught by teachers who are not fully prepared” (p. 135). Additionally, she noted that alternatively trained teachers tend to have more difficulties in areas such as curriculum development, differentiating instruction for diverse learners, and motivation. Her findings were supported by McDiarmid and Wilson (1991) who studied 55 elementary and secondary math teachers. All the teachers had

degrees in math and all had entered teaching via an alternative licensure program. A review of interview and questionnaire data led them to conclude that alternatively trained teachers may not be well trained to help students, particularly elementary students, understand math. More recently, a six-year study (1995-2002) on teachers in the Teach For America program involving 212,724 students in grades 4 & 5 from Houston, Texas confirmed that teachers with full certification produce higher student gains (Darling-Hammond, et al., 2005). However, not all researchers come to the same conclusions; numerous studies have cast doubt on the superiority of traditionally credentialed teachers.

Using qualitative variables such as principals' ratings of performance, teacher attitudes, and teacher self-evaluations, three studies (Guyton, Fox, & Sisk, 1991; Hawk & Schmidt, 1989; Lutz & Hutton, 1989) found no difference in the performance of teachers licensed via alternative programs. Additionally, Stafford and Barrow (1994), and Miller, McKenna, and McKenna (1998), using student achievement as the outcome variable found no difference between the effect of teachers with traditional licensure and those with alternative licensure.

The findings from these studies suggest that two components of teacher licensure affect student achievement. First, is the *type* of license, either standard or alternative, and second is the *content area* in which the license is issued. These studies indicate that standard certification makes a difference in student performance in the area of mathematics; the relationship of subject specific licensure and student performance is not well documented in other content areas. Further, the studies reviewed present mixed results when assessing the effect of traditional licensure training vs. alternative routes to licensure.

Degrees Obtained and Coursework Taken

A definitive link between courses taken or degrees conferred and student achievement has not been established in all subject areas. However, a case can be made for a link between teachers' coursework or degree granted and math achievement (Goldhaber & Brewer, 1997a, 2000; Monk & King, 1994; Rowan, et al., 1997). In particular, four studies, three of which used the NELS: 88 dataset, support the existence of this link in mathematics.

Goldhaber and Brewer (1997a) used the NELS:88 dataset to examine the student achievement gains from grade 8 to grade 10. Controlling for teacher characteristics of certification, math certification, and years of high school teaching experience, they found no differences in student achievement based on whether the teacher had a master's degree. However, when they accounted for the subject of the degree, they found that teachers with a master's degree in math produced higher performing math students. Teachers possessing undergraduate degrees in math also produced higher performing math students. The researchers conducted a similar study (Goldhaber & Brewer, 2000) using the same dataset, but this time examined the gains from grade 2 to grade 12 in math and science. They found the same significant results for math, and they found positive, but not significant, effects for science.

Rowan, Chiang, and Miller (1997) also examined the NELS:88 dataset. They used a single variable to indicate whether teachers had either an undergraduate or graduate degree in mathematics. Their findings indicated that students whose teachers had a degree in math performed better.

Some studies have gone beyond examining the degree conferred and have looked at the amount of coursework taken in a particular subject and the effect it has on student achievement. Monk and King (1994) used the Longitudinal Survey of American Youth (LSAY) to examine whether the numbers of courses teachers take in math and science affected student achievement. The LSAY is a sample of 2,831 public school 10th-graders from the fall of 1987 through their senior year. The students took the NAEP in the fall of 1987 and again in fall 1989. The survey included teacher characteristics of years of teaching experience and courses taken. The researchers divided the courses taken into math, life science, and physical science. Many of the findings were inconclusive; however two findings were significant in the area of math. First, they found that 10th-grade students who performed well on the fall test posted higher 1-year gains when their teachers had more math courses. Secondly they found that from 1987 to 1989 students learned more math when their teachers had taken more math courses. Oddly, they found that juniors in the sample learned less science from teachers with more physical science coursework. They suggested that this finding may be attributable to the lack of specificity that sometimes exists when describing or reporting science courses (i.e. course titles may not describe well the content delivered).

The literature reviewed here supports the idea that teachers with a stronger preparation in the area of math produce students who perform better in math. There is some support for this same connection in the area of science. Druva and Anderson (1983) conducted a meta-analysis of 65 studies of the relationship between science teacher characteristics and student outcomes. Their findings include a positive relationship

between the number of biology courses taken by biology teachers and student achievement.

The relationship of coursework and student performance is mixed for English and history. Goldhaber and Brewer (1997a) found that having English or history degrees had no effect on student achievement. No studies were found on the relationship between special education preparation and the performance of students with disabilities in the literature.

Teaching Experience

Studies on the effect of teaching experience on student achievement have produced mixed results. Hanushek (1986) reviewed 147 studies on the relationship between teacher characteristics and student achievement, 109 of which examined the effect of teaching experience. He found less than half of them to have a statistically significant effect on achievement; of those that did, 33 were positive and seven showed a negative relationship. More recent studies using refined techniques indicate a more consistent effect of teaching experience in a variety of settings.

Croninger et al. (2007) analyzed the Kindergarten Class of 1998-1999 in the Elementary Children Longitudinal Study (ECLS-K) to examine the effects of elementary teachers on student achievement. Their study was designed to inform policy by extending the extant research on secondary teachers. The longitudinal nature of the study allowed them to track student achievement from the students' kindergarten year to third grade. They used reading and math achievement data from a national sample of 5,167 students linked to 1,342 teachers in 453 schools to assess the effect of six teacher variables, one of which was teaching experience. They assigned teachers to one of three experience

categories: 0-2 years, 3-4 years, and 5 or more years. They found that teaching experience was one of only two teacher variables having an effect on student achievement. Specifically, they found that students with more experienced teachers (3 or more years) achieved more in reading than those with beginning teachers (0-2 years); however, students whose teachers had five or more years of experience did not perform any better than those with 3-4 years.

The positive effect of teaching experience was also supported in a recent study done in a large Midwestern urban school district (Vanderhaar, Munoz, & Rodosky, 2006). The researchers used teaching experience as one of several contextual variables in their study on how principal preparation programs affect student achievement. Although they found little influence from principal preparation programs on student achievement, a strong correlation ($r = .67$) between teacher experience and student outcomes on the Comprehensive Test of Basic Skills existed. They suggested that such a robust finding was cause for urban schools to consider ways to place more experienced teachers in high need schools.

Huang and Moon (2009) also studied the effect of teacher characteristics, including teaching experience, on student achievement in high poverty schools. They used hierarchical linear modeling (HLM) to analyze data from 1,544 second grade students linked to 154 teachers in 53 low performing Mid-Atlantic schools. Although total years of teaching experience was not found to be a significant predictor of students' reading achievement, years of experience at a specific grade level was.

Finally, Rockoff (2003) investigated the effect of teacher quality on student achievement over a 12-year period (1989-1990 to 2000-2001). His study linked students'

test scores from nationally standardized tests in reading and math to their teachers in two New Jersey school districts with an average SES above the state median. Making the assumption that additional teacher experience has little effect on achievement, Rockoff set a cut off for experience at 10 years. Although he did not find any effect on math achievement, he found that vocabulary and reading comprehension were positively influenced when teachers had more than nine years of teaching experience.

Teacher Ownership and Teacher Self-Efficacy

Teachers who take ownership of their student's success believe that the students belong in the school, and that they as teachers have the wherewithal to help students succeed. The concept of ownership of student success promoted here can also be conceptualized as teacher self-efficacy (Bandura, 1997).

There is evidence that teachers' self-reported beliefs about efficacy promote student achievement (Allinder, 1995; R. N. Anderson, Greene, & Loewen, 1988; Armor, et al., 1976; Ross, 1992). The affect on student achievement can result from individual teacher perception, and from a collective perception. Tschannen-Moran and Barr (2004) examined the impact of collective teacher efficacy (CTE), the collective belief that teachers can make a difference in children's lives, on student achievement. They compared CTE, as measured by the Collective Teacher Beliefs Scale, to student performance on high-stakes tests. They found a significant relationship between the CTE and student achievement for all three of the subjects assessed: math, writing, and English. The authors concluded that because teacher behaviors may influence student achievement, teachers should be encouraged to accept responsibility for student achievement. Stoll's work (1999) supports this conclusion. She suggested that promoting

collective responsibility is one way of building the internal capacity necessary for school improvement.

One of the objectives of teacher ownership is to create a sense of belonging in the students, insofar as students understand that their teachers view them as essential partners in the learning process. This objective has the potential to be of particular importance for students with disabilities. These students are by definition low achievers and many also suffer from low self-esteem (Brody & Mills, 1997; Murray & Pianta, 2007; Talbott & Fleming, 2003). Hence, developing a sense of belonging is critical for this population. Next is a discussion of four studies that explore the effect schools and teachers have on fostering a feeling of belonging in students.

Swaminathan (2004) suggested that schools have the power to provide a special place for students or to exacerbate their already tenuous self-concept by making school a place owned by adults and not by students. He studied graduates of an urban alternative school to see how they felt about the quality of the education they received from their alternative school compared to what they had experienced in the traditional public schools they had left. He found that for urban schools to be effective, they need to create a physical space for students that the students can consider to be *their* place at school. The alternative school graduates in his study felt as though they did not belong at the traditional school; the traditional school was run by adults for adults. Students did not see that they had a *real* place there. What the researcher found in the alternative school was a curriculum and a physical facility that was organized around the needs of the students. Students referred to it as *my* place. Swaminathan concluded that the physical spaces created by the alternative school were crucial in promoting a sense of identification,

commitment, integration, and alliances among students and faculty. The students felt trusted with adult responsibilities, which led them to reciprocate the trust. Relationships between students and faculty promoted feelings of commitment to one another.

Designing a welcoming environment that promotes a sense of belonging among students with disabilities is not easily accomplished. There are many potential challenges, including teacher attitudes towards students with disabilities. Cook and Tankersley (2000) found that although general education teachers typically have a positive attitude toward the concept of inclusion, that attitude does not always manifest itself in the attitudes shown toward individual students with disabilities included in the general education setting (included students). Examining the four attitudinal categories of attachment, concern, indifference, and rejection, they were encouraged to find that included students were overrepresented in the area of concern. Discouragingly, they also found that the problematic behaviors of some included students led to overrepresentation in the categories of indifference and rejection.

Several studies have reviewed effective inclusion programs, examining how the variable of ownership contributes to their success. Rouse and Florian (1996) explored the progress of effective inclusion programs in the United States and Great Britain. Their findings suggest that a key component of effective inclusive schools is leadership that stresses ownership, or shared responsibility, of all the students on the part of all the adults. Data collected from interviews with key stakeholders were categorized into themes consistent with Stoll's (1991) 12 characteristics of effective schools². The

² Stoll (1991) identified characteristics effective schools as: (a) shared values and beliefs, (b) clear goals, (c) instructional leadership, (d) collaborative or partnership teaching, (e) teacher collegiality, (f) ongoing

findings led Rouse and Florian to describe an effective inclusion school as one with a common mission, an emphasis on learning, and a climate conducive to learning.

Brigharm et al. (2006) concluded that "students become motivated to succeed when they experience a sense of connection and belonging to the school through relationships with adults and/or other students" (p. 188). They reached this conclusion after closely studying three high schools that had been identified as high performing high schools and that met their criteria to be labeled good high schools for students with disabilities. They set out to confirm the achievement outcomes and learn what schoolwide approaches, general and special education collaborations, service models, and instructional supports contributed to student achievement.

The researchers identified five common strategies integrated in a synergistic approach to educating students with disabilities: (a) provide academic choice, (b) provide ensembles of academic support, (c) connect with and motivate students, (d) build an adult community, and (e) develop responsive leaders (Brigharm, et al., 2006). Although all three schools were unique, they had underlying similarities in the way they approached students with disabilities. Each school had a larger school mission, and, within that mission, each school had a vision for students with disabilities. They allowed students with disabilities to have unlimited academic choices. Students with disabilities were not defined by their label, but by their performance in the classroom. Each school customized an ensemble of supports to help each student as necessary. They invented ways to

staff development, (g) frequent monitoring of pupils' learning, (h) parental and community involvement and support, (i) positive student behavior, (j) the use of recognition and incentives, (k) an inviting physical environment, and (l) student involvement and responsibility.

motivate students with disabilities by connecting them with adults and other students. They tailored opportunities to enhance each student's achievements. Finally, they encouraged staff to think of the school as a single integrated system with a unified purpose rather than a collection of departments, courses, and teachers.

Attempts have been made to examine and define the role of teacher self-efficacy in special education. Carlson, Lee, and Schroll-Westat (2004) performed a factor analysis on the SPeNSE dataset in an effort to confirm five attributes of high quality special education teachers gleaned from the literature. Their analysis of data from 1,475 special education teachers led them to the conclusion that the five attributes were present in high quality special education teachers; among those attributes was teacher self-efficacy.

Student Variables

A student's level of achievement is shaped by many factors. These factors, or variables, can be inherent to the student (Ladd & Dinella, 2009) or can be acting upon the student from an external source within the student's environment (Baker, 2006; Burke & Sass, 2008; Chen, 2007). This section will discuss variables brought to the process of student achievement by the student. Some of the variables are personal characteristics and some are socially constructed. All have been studied extensively and have been found to impact the degree of achievement attained by a child.

Gender

The effect of gender on school achievement is a well researched topic. Early studies focused on gender differences affecting learning and maturity. As the body of work grew and as the women's liberation movement progressed, educational equity became a central theme. Numerous programs were instituted as a way to get girls into

nontraditional educational programs and enrolled in science and math courses. The programs seem to have been so successful that today pundits are bemoaning a gender gap that has boys at a disadvantage rather than girls (Viadero, 2006; Wiens, 2005).

Historically, the research tends to support the notion that girls have an advantage over boys when it comes to language learning. Reading and literacy seem to develop earlier and more rapidly for girls. Ready, Logerfo, Burkam, and Lee (2005) examined data from the Early Childhood Longitudinal Study (ECLS) on 16,883 kindergartners and concluded that girls enter kindergarten with superior literacy skills and that they progress slightly faster than boys during their kindergarten year. This finding is supported by NAEP data that reveal a consistent pattern of girls' superior performance on fourth-, eighth-, and 12th-grade reading assessments (Freeman, 2004), and fourth-grade results of the Progress in International Reading Literacy Study (Baer, et al., 2007).

Studies on the effect of gender on math achievement have produced mixed results. Some report a male advantage in general math functioning (Mau & Lynn, 2000) and others suggest boys have an advantage, but only in specific skill areas (Casey, et al., 2001; Gallagher, et al., 2000). Differences favoring girls tend to be reported at younger ages (Marshall & Smith, 1987). Other studies report no differences (Tate, 1997).

Lachance and Mazzocco (2006) conducted a four-year-long longitudinal study on 200 students in early primary school in which they administered annual tests of math ability, math calculation, visual perception, and visual motor skills. They found no difference between male and female performance overall or in any one year and concluded that there is no gender advantage in math for primary age school children.

Socioeconomic Status

Any discussion of student achievement should include an acknowledgement of the role of affluence. The plight of students in poverty and the effect that poverty has on academic outcomes is well documented. Congress acknowledged the need to provide remediation for students in poverty when it instituted the Title I program as part of the Elementary and Secondary Education Act (ESEA) in 1965. Although Title I programs have been relatively successful (U.S. Department of Education, 2007), the achievement gap between students in poverty and those not in poverty has persisted. Recent analyses of large databases such as the NAEP (Terwilliger & Magnuson, 2005), ECLS (Chatterji, 2006; Gershoff, 2003), and the National Longitudinal Survey of Youth (Dahl & Lochner, 2005) have confirmed the existence of achievement gaps for math and reading despite efforts taken to eliminate them.

Ethnicity

Analyses of large scale assessments such as state level assessments and NAEP have demonstrated a persistent gap between the achievement of white students and their African-American and Hispanic peers (Campbell, et al., 2000; Lee, 2002; Snipes, et al., 2007). The disparity exists in reading and math and at all grade levels assessed. Nonetheless, students of all races show progress on state and federal assessments. Researchers have been encouraged by the recent narrowing of the gap, especially during the two decades from 1971 to 1990, but worry that gains for students of color are slowing to the point that the gap is no longer decreasing. There is evidence that some of the achievement differential is due to socioeconomic factors (Lubienski & Shelley, 2003).

Disability

The imperfect ability to learn has interested scientists for centuries. Early European and American researchers were primarily concerned with the etiology of disabilities (Hallahan & Mock, 2003). It was not until the 1920s, after most states had enacted compulsory education laws, that the emphasis in disability research in the United States shifted to remediation (Hallahan & Mercer, 2001). As this shift occurred, researchers became interested in the effects of intraindividual differences and postulated that learning problems, such as reading disabilities, required specific remedial techniques. Heinz Werner and Alfred Strauss (as cited in Hallahan & Mock, 2003) challenged the notion that mental retardation was a homogeneous state, suggesting that it could be either endogenous or exogenous. Prior to that time, conditions such as traumatic brain injury and cerebral palsy had been included under the broad category of mental retardation. Cruickshank, Bentzen, Ratzeburg, and Tannhauser (1961) extended the work of Werner and Strauss in their work on cerebral palsy and helped initiate the concept of learning disabilities (LD) and its plethora of accompanying educational techniques.

The emergence of the field of learning disabilities and the advent of the Education of the Handicapped Act of 1975 (EHA) led to a dramatic increase in the number of students with disabilities and the types of approaches to serve them (U.S. Department of Education, 2006b). Labeling children with disabilities as mentally retarded or “slow learners” and providing them with a life-skills program gave way to the promulgation of numerous instructional techniques matched to the student’s specific disability and focused more on academics (Hallahan & Mock, 2003). Programs as well as techniques became disability-specific; however, as the field of special education matured, the

practice of providing services in a disability-specific fashion received some criticism. Many educators saw the labels as limiting opportunities and services for children instead of helping others to understand their disabilities (Wheldall, 1994). As a result of this criticism, many educational programs are now designed to serve children categorized as having mild, moderate, or severe disabilities ("Ohio department of education," 2008). If most early practitioners agreed that life skills were an important part of special education, priorities have been revised, in large part due to political changes. The standards-based accountability push has moved the field away from providing life-skills training in a functional curriculum (Browder, et al., 2005) and created an expectation that all students with disabilities will compete in an academic curriculum.

Summary

The use of student academic performance, particularly on state assessments, as an indicator of teacher quality and as a way to evaluate teacher preparation programs and teaching practices is growing. The four teacher characteristics discussed here influenced by the teacher training process or by laws regulating the process, do appear to make a difference in student achievement. The variable of teacher self-efficacy also seems to have an effect. Collectively, the variables discussed here have in common a lack of information as to how they affect the performance of one of the neediest groups of children—those with disabilities. The importance of the teacher in the learning process is axiomatic. That being the case, more research needs to be done on how the quality of that teacher affects the achievement of students with disabilities.

CHAPTER 3: METHODOLOGY

Educational research is generally categorized as qualitative, quantitative, or mixed (Mertens, 2005). This chapter describes the techniques used to gather and analyze the data for the study. The purpose (including expanded research questions), a data collection time frame, and a conceptual framework are presented. Following is a description of the participants, including information on the teachers and students included in the study. Next, the teacher and student variables that were the focus of the study are presented in detail. The fourth section describes the data collection process and the final section explains the statistical processes used to analyze the data collected for this study.

Purpose

This study was designed to examine the extent to which various teacher characteristics affect the performance of students with disabilities on high-stakes tests. Although student performance outcomes were used, it was the teacher that was of primary interest. The unit of analysis in this study was special education teachers. Data on the characteristics of special education teachers were collected as was demographic and performance data on their students. The data were then analyzed, examining the relationship between the various teacher characteristics identified and student performance, while controlling for the influence of specific student and teacher characteristics.

Time Frame

Student performance data came from annual state assessment results that Ohio school districts are required to report. Ohio recently began producing value-added data on the performance of students on state assessments. Value-added data is the term given to

data that reflect the progress students make on successive test administrations. For accountability purposes, the *value* added to the student is attributed to the school district, school, and, increasingly, the teacher. Ohio's value-added data calculation is based on the model developed by Sanders (2006). The value-added metric supplied by the state of Ohio undergoes several processing steps before it is released to school districts for their use. Given the time required by the state to complete the necessary data processing steps, the data are not available to districts until the November following the school year for which they were collected. Therefore, the most current data available dictated that the study be based on teacher characteristics and student performance from the 2006-2007 school year.

Conceptual Framework

The data were analyzed based on the notion that teacher quality enhances student performance. More specifically, the quality of special education teachers enhances the performance of students with disabilities on high-stakes tests. The indicators of teacher quality scrutinized are largely factors involving teacher preparation. The premise of this study was that teachers who are better and more thoroughly trained will more positively influence the performance of students with disabilities on high-stakes tests. This was thought to be particularly true of teachers with high self-efficacy, a variable that is not necessarily linked to teacher preparation. Further, it was posited that disability, specifically cognitive disability (CD), plays a distinct role in determining how teacher characteristics affect student achievement.

Research Questions

The research questions from Chapter 1 highlight the two main focuses of this study— namely, the extent to which the five teacher characteristics identified account for the achievement of students with disabilities on high-stakes tests and does this achievement vary as a function of type of disability? These general questions imply more specific questions, four of which were addressed in this project:

1. Are differences in reading gains for students with disabilities associated with the teacher characteristics?
2. Are differences in reading gains associated with the student variables of gender, ethnicity, SES, and disability consistent across teachers?
3. Are differences in students' reading gains associated with selectivity of college attended by teachers, their license type, their license area, the courses they took, and their level of self-efficacy with regard to teaching?
4. Are differences in students' reading gains among teachers the same for all disability types?

It was hypothesized that there would be differences in student achievement among teachers and that the teacher characteristic contributing the most to that difference would be self-efficacy. It was also predicted that the students' type of disability would be a significant determinant of achievement.

Participants

The participants in the study were teachers of students with disabilities in grades 4-8 from eight school districts in west central Ohio, ranging in size from approximately 1,000 to 5,000 students. Five of the districts are best described as rural and the other three

fall into the category of suburban. The suburban designation may be somewhat misleading as these three districts are small cities that comprise the population centers of their respective counties. As such, these school districts have a racial and economic diversity that may not be found in what is typically considered suburban communities. Each of the small city districts has high poverty schools whose demographic composition closely resembles that of an urban school. This demographic diversity among students may allow the results of this study to be generalized to a broader range of educational settings than those found in rural and suburban communities.

Determining the sample size necessary for adequate statistical power in multi-level modeling is not as straightforward as it is for other techniques. Various guidelines are offered for the appropriate number of groups and subjects within each group in the literature. Hox (2002) devoted an entire chapter to the topic in which he concluded that ML estimation leads to unbiased estimates except in the case where sample size at level 2 is less than 50. Substantial sample sizes are necessary when evaluating large, complex models with multiple levels and parameters (Tabachnick & Fidell, 2007); however, there is interplay between the number of groups at each level and the number of subjects within each group. Snijders and Bosker (1999) report that group sizes can be as small as one as long as other groups are larger and assumptions of normality are met. Tabachnick and Fidell report that power tends to increase with sample size and decrease with smaller effect sizes and larger standard errors. Additionally, simulation studies indicate power is increased with more level-2 groups and fewer subjects per group than the converse. Although this study has two groups of 2, there are 50 groups of 4 or more resulting in a

level-1 sample size of 462. This and a level-2 sample size of 55 teachers suggest a sufficient sample size.

Teachers

The state of Ohio uses the term *Intervention Specialist* to describe teachers trained to educate students with disabilities. Intervention Specialists deliver services in several settings, including self-contained classrooms, resource rooms, small groups (tutoring), and supplemental services (inclusion). Teachers performing the duties of Intervention Specialists from all eight of the school districts with any part of their caseload falling in the range of grades 4-8 for the 2006-2007 school year were recruited for the study.

Student Data

Performance and demographic data were collected for those students who received reading instruction during the 2006-2007 school year from any of the participating Intervention Specialists. The students had been identified as having a disability in accordance with the laws governing the identification of students with disabilities in the state of Ohio prior to receiving services. Additionally, the students had taken the Ohio Achievement Test in 2006 and 2007 and were designated on the school's Where Kids Count report as included in the school's accountability measure for the 2006-2007 school year.

The Where Kids Count report is generated by the Ohio Department of Education to inform schools at what level each student's performance will be used. In Ohio's accountability system, student performance is used for accountability purposes at three levels: the school, the school district, and the state. The determination as to where a student's performance counts is based on attendance. Students who attend one building

for the entire year, defined as the time period between the October Average Daily Membership count and May testing, count in that building's accountability report as well as the district's and the state's. Students spending the majority of the year (91 school days) in one district, but not in one particular building, count in the district and state reports. Students who do not spend a majority of the year in any one district are included in only the state report. To be included in this study, students had to appear on the school's report, signifying that they had been instructed by the participating teacher for the entire school year as defined above.

A wide range of disabilities were represented in this study; however, given that nearly half of all students with disabilities have LD (National Center for Education Statistics, 2004), it was not surprising that the preponderance of students in the study were designated as LD. Students with intellectual disabilities, emotional disabilities (ED), other health impairments, multiple disabilities, hearing impairments, visual impairments, language impairments, orthopedic impairments, autism, and traumatic brain injury accounted for the remainder of the performance data. Students taking the alternate assessment or the modified assessment were not included.

Variables

Student achievement is the result of the interaction of seemingly myriad explanatory variables. Variables internal to the student as well as those from outside sources affect student achievement. A student's demographic profile can have a significant influence on eventual success in school. Factors external to the student, such as the school environment or the classroom teacher, also can have a substantial impact. It

can be reasoned, then, that variables affecting one of these external factors, such as the quality of teacher preparation, will have an indirect effect on student achievement.

This study examined several explanatory variables that have been shown to have a bearing on the academic performance of students (although evidence of this link has not always been established for students with disabilities). These variables were divided into teacher and student variables. The outcome variable under study was student reading achievement.

Outcome Variable

In response to House Bill 3, the Ohio Department of Education created the Ohio Accountability Task Force in December 2003 with the mission to establish a value-added component for Ohio's school accountability system. The purpose of the value-added system is to give schools the tools needed to track student progress over time. Combined with the implementation of a statewide student identification number system, a student's progress can be tracked regardless of whether he stays in the same school from one year to the next. Value-added data began being made available to school districts for the 2005-2006 school year. The value-added component became part of the accountability system in 2008.

The current literature points to value-added modeling (VAM) as a widely accepted approach to measuring teacher and school effectiveness; however, there is not complete consensus as to how to model the various effects on student achievement. At issue is the role teacher effects play versus school effects. Raudenbush (2004) suggests that there are two types of effects; those that are of interest to parents (Type A) and those of interest to state officials (Type B). He argues that VAM is best suited for assessing the

Type A effect, which is the combined effects of context and practice. Rubin, Stuart, and Zanutto (2004) warn against using a VAM that doesn't consider multiple potential outcomes. They argue that when potential outcomes are not considered, the only other outcome under consideration is the baseline, or no change. They see this as an unlikely outcome in any educational environment. They also suggest that models that do not account for potential outcomes provide descriptive measures and not the causal effects purported by the researchers who use them (2004).

The complexity of the VAM required for accurate prediction of teacher effects is another source of disagreement. Tekwe et al. (2004) make the case that a simple fixed effects model can be as efficient at measuring academic growth as the more complex HLM models preferred by many researchers (McCaffrey, Lockwood, Koretz, Louis, & Hamilton, 2004; Raudenbush, 2004; Sanders, 2006; Wright, 2004) when using only two years of data. They do, however concede that adjusting for socioeconomic factors as is done in mixed modeling is preferable when high-stakes testing is involved. The model in this study included a random effect in addition to fixed effects as recommended by Raudenbush (2004).

In Ohio's value-added accountability system, the Ohio Achievement Test (OAT) is administered annually to students in grades 3-8. Various subjects are tested at specific grade levels with reading and math tested at each grade. The value-added component is based on annual student gains in reading and math, making value-added scores available for grades 4-8. This value-added system takes into account prior student achievement by tracking and comparing students' scores across time. This approach compares students to themselves rather than the status-score method where student cohorts are compared to

previous, unrelated cohorts. This comparison is made by converting raw scores into normal curve equivalent (NCE) scores. The NCE scores are then normalized on a common year. Problematic in this type of comparison is that even though students are being compared to themselves, they are being compared at different grade levels. Whether the achievement tests at different grade levels are comparable and whether the scaling is accurate from one grade level to another is at issue. Ohio's value-added system accounts for problems of scaling by normalizing all the scores used in the process on the same year of results. In this instance, the results from the 2007 test administration were used as the basis of the comparison and the 2006 scores were fitted to the 2007 distribution. The outcome variable then was the amount of annual student gain in reading (Reading Gain) as determined by subtracting each student's 2006 NCE from their 2007 NCE.

The use of gain scores in educational research has come under scrutiny (Rock, 2007); however, gain scores are not inherently unreliable (Williams & Zimmerman, 1996) as some have suggested. Multiple sources of error exist when calculating gain scores because of the possibility of measurement error in the pretest and the posttest (Borg & Gall, 1989; Rachor & Cizek, 1996). To mitigate some of this concern, the pretest can be used as a covariate (Tekwe, et al., 2004). The covariate approach is appropriate in experimental conditions where the pretest precedes the treatment (Rubin, et al., 2004). In observational studies where the treatment may occur prior to the pretest, the use of raw gain scores is more acceptable (Fitzmaurice, Laird, & Ware, 2004). This study attempted to overcome some of the limitations of gain scores by using the students'

NCE scores from 2006 (NCE_2006) as a covariate to control for potential measurement error.

Explanatory Variables

Explanatory variables are generally referred to as predictor variables in regression analysis because of their use in predicting the outcome variable. For this study, explanatory variables were labeled as either predictor or control variables. Used here, predictor variables were those phenomena of interest whose degree of presence or absence was theorized to substantially influence the outcome variable. Control variables were those factors that had been shown to correlate with achievement and should be accounted for when examining the potential effects of the predictor variables under study. Both of these categories were represented in the teacher variables and the student variables in this study.

Teacher variables. At the heart of this study is the effect specific teacher characteristics have on student achievement. There are five such teacher characteristics that were included as predictor variables in this study. Four of those five characteristics mirrored those found in the literature on student performance as a function of teacher effectiveness. All four are measures of teacher quality pertaining to teacher preparation and regulation of the teaching profession. The fifth variable, teacher self-efficacy, dealt with personal characteristics. A sixth variable, years of teaching experience, was included as a control variable to account for the effect of experience on student achievement.

Conventional wisdom suggests that high quality colleges produce high quality graduates, and that the degree of selectivity of a college is an indicator of quality.

Ehrenberg and Brewer (1994) and Summers and Wolfe (1975, 1977) studied the effect of

college quality on student achievement using published ratings of the colleges as the measure of quality. Similarly, selectivity ratings from *Barron's Profiles of American Colleges* (Buono, 2008) were used as a measure of institutional quality in this study. Barron's rating of the college or university from which the teacher received special education training was used as the college quality variable. If the teacher had no special education training, then the selectivity score of the college where she received a bachelor's degree was used. The Barron's Selectivity Scale assigns schools to one of six categories based on their degree of selectivity as determined by the school's entrance requirements and acceptance rates. In three of the categories a finer distinction is made and schools with higher standards are assigned a *plus*, yielding nine categories. The nine categories are, from least selective to most selective, noncompetitive, less competitive, competitive, competitive plus, very competitive, very competitive plus, highly competitive, highly competitive plus, and most competitive. Five of the nine categories were represented in this study; however, because the highest category was represented by only one teacher, it was combined with the second highest category leaving four categories (noncompetitive, competitive, very competitive, very competitive plus/highly competitive) in the analysis.

Teacher licensure is designed to ensure the quality of teachers in public schools. States establish rigorous criteria for prospective teachers so as to ensure that the students they eventually teach receive high quality instruction. An undersupply of qualified teachers in hard-to-staff areas like special education has led states to relax their standards and admit individuals to the teaching profession who have not met the established requirements (Mikulecky, et al., 2004). The second predictor variable used in the study

was licensure status. The type of license a teacher held was recorded. The primary concern was whether the teacher had a standard intervention specialist license, or had been credentialed through an alternative licensure process.

Research into the effects of teacher licensing has been largely focused on the differential effect of a teacher being fully credentialed. Concomitant to that research, the effect of teachers with subject-specific credentials has also shown positive effects on student achievement. These studies generally take place in secondary schools and focus on math and science (Goldhaber & Brewer, 1997a, 2000), but the same positive effects have been found at the elementary level for the general elementary education degree (Croninger, et al., 2007). To capture this facet of teacher licensure, the designated disability area in which the special education teacher was licensed was gathered and used in the analysis.

The amount of coursework an individual completes has been shown to have a bearing on student performance (Monk & King, 1994). As an indicator of preparation, the fourth teacher variable used in this study was the amount of coursework completed. Any special education coursework applied to a degree or taken as continuing credit, whether undergraduate or graduate, taken prior to the 2006-2007 school year was summed and recorded in total semester hours. Field experience and student teaching were not included as coursework.

The final predictor variable³ used in the analysis was the degree of ownership special education teachers took for the performance of their students. Teacher ownership

³ The predictive ability of Praxis II on student gain was another variable that was to be included in this study. A small survey was conducted among potential participants to ascertain the availability of scores and

was measured by the presence of teacher self-efficacy. Although teacher self-efficacy is not found in the literature on teacher effectiveness as measured by student performance, its relationship to teacher effectiveness as measured by self-report instruments has been studied (Allinder, 1994, 1995; Carlson, et al., 2004; Coladarci & Breton, 1991). Data on self-efficacy was collected by administering the Teacher's Sense of Efficacy Scale (TSES) developed by Tschannen-Moran and Hoy (2001) and formerly known as the Ohio State Teacher Efficacy Scale (see Appendix A).

The instrument used in this study to assess the teachers' perceived self-efficacy was the long form of the TSES developed by Tschannen-Moran and Hoy (2001) after concluding that "a new measure of teacher efficacy that is both reliable and valid is needed" (p. 795). They based the TSES primarily on the conceptualization of self-efficacy theorized by Bandura (1986). The instrument consists of three subscales that coincide with the task of teaching: efficacy for instructional strategies, classroom management, and student engagement. Using Cronbach's alpha, their studies yielded reliability estimates of .91, .90, and .87 for the subscales respectively. Construct validity of the scores was assessed by correlating the scores with two efficacy items ($r = .18, .53, p > .01$) from the Rand study (Armor, et al., 1976) and with the constructs of *personal teaching efficacy* ($r = .64, p > .01$) and *general teaching efficacy* ($r = .16, p > .01$) from the Teacher Efficacy Scale (Gibson & Dembo, 1984). They concluded the instrument to be reasonably reliable and valid. Their study was further validated by Heneman, Kimball, and Milanowski (2006) who conducted a predictive validity study on the short form of

the willingness of teachers to share them. The promising results led to the inclusion of teacher testing as one of the variables. However, the scores proved to be largely uncollectable and the variable was dropped.

the TSES with resulting coefficient alphas for the subscale scores and total scores ranging from .75 to .90. The instrument was piloted with several volunteers prior to use in the study to ensure its ease of self-administration and gauge completion time.

Finally, it has been shown that teaching experience has an effect on student achievement with more experienced teachers showing students with greater gains (Greenwald & Hedges, 1996). However, some researchers are quick to point out that such a relationship is difficult to interpret due to the attrition of new teachers and the belief that the teachers leaving the profession may be above average performers (Wayne & Youngs, 2003). Data on the number of years of teaching experience, inclusive of general and special education, for each teacher were collected and used as a control variable.

Student variables. The focus of this study was on how teacher characteristics affect student learning. Those effects should not be studied without considering student characteristics that have been shown to also influence achievement. Disregarding the effect of student characteristics could lead to the overinterpretation of the influence of teacher characteristics on student achievement. In an effort to prevent such bias, data on four student demographic variables were collected, each of which has been shown to have an effect on student achievement.

Three of the variables were used as control variables. The first such student variable was gender. Girls tend to outperform boys beginning in grade school and continuing through high school (Freeman, 2004; Viadero, 2006). This trend appears to have extended to post secondary education, where females now comprise 58% of all undergraduate students (Klecker, 2006).

The effect of socioeconomic status and race on academic achievement has received a great deal of attention. Students from low SES families tend to score lower on standardized tests and have generally depressed school performance (Terwilliger & Magnuson, 2005), and students of color tend to score lower than their white counterparts (Lubienski & Shelley, 2003). SES was determined by eligibility for the federal free and reduced lunch program. The ethnicity data gathered from student records indicated that the sample of students was 4.3 % African American, 0.2% Hispanic, and 6.3 % identified themselves as multiracial. Because the proportion of students in each of the categories of minorities was so small, all the minorities were combined into one category making ethnicity a dichotomous variable of white (89.2%) and nonwhite (10.8%).

The fourth variable, the type of disability a student has, served a dual purpose. Disability was used as a control when estimating the effect of student characteristics, and also examined for its predictive qualities, especially in regard to potential interaction with teacher characteristics. The type of disability was defined as the category label the school district used to identify the student's disability (e.g. LD or ED). The number of students identified with multiple disabilities, hearing impairments, visual impairments, language impairments, orthopedic impairments, autism, and traumatic brain injury was so small that they were combined into a single category labeled Low Incidence (LI). The variables used in the study are summarized in Table 1.

Procedures

Human Subjects Protection

This study complies with all applicable regulations guiding research at Indiana University. The researcher passed the Human Subjects Protection Test and approval for

the use of human subjects was obtained from the Indiana University Institutional Review Board (IRB Study #08-13083) before commencing on this project. Special care was taken throughout the study to ensure a high degree of confidentiality and anonymity for teachers and students. The goals of the study were carefully explained to the participants

Table 1

Definitions of Variables Examined (by Level)

Level	Variable	Purpose	Definition/Coding/Range
Student	Gender	Control	1 = Male, 0 = Female
	SES	Control	1 = Participates in school lunch program, 0 = Does not participate
	Ethnicity	Control	1 = White, 0 = Nonwhite
	Disability	Predictor	1 = Cognitive Disability, 2 = Emotional Disability, 3 = Learning Disability, 4 = Other Health Impaired, and 5 = Low Incidence
	NCE_2006	Control	Student NCE score for 2006
Teacher	College Selectivity	Predictor	1 = Noncompetitive, 2 = Competitive, 3 = Very Competitive, 4 = Very Competitive Plus/Highly Competitive
	License Type	Predictor	0 = Standard special education license, 1 = Temporary or alternative license
	License Area	Predictor	1 = Mild/Moderate, 2 = Cognitive Disability, 3 = Learning Disability, 4 = Cognitive and Learning Disability
	Coursework	Predictor	Total semester hours of coursework in special education taken at either the undergraduate or graduate level.
	Teacher Self-Efficacy (TSE)	Predictor	Score on Teacher's Sense of Efficacy Scale. Range from 24-216.
Outcome	Experience	Control	Number of years teaching.
	Reading Gain	Outcome	NCE gain on the OAT in reading from 2006 to 2007

and written consent was obtained prior to data collection (see Appendix B). Directors of special education and district EMIS coordinators were the main contacts and were involved in procedures used to ensure confidentiality. Direct requests to teachers were kept to a minimum. Teacher data were collected during the final quarter of the 2007-2008 school year and student data were collected during the summer of 2008.

Data Collection

Superintendents and /or directors of special education in 18 school districts in five counties located in west central Ohio were recruited for the study. The geographical area encompassed a wide range of communities including urban, suburban, and rural. School administrators generally showed a keen interest in the study, indicating that the results may be beneficial to them. Nine of the districts agreed to participate; one district was unable to provide student data due to personnel changes and dropped out of the study.

The collection of teacher and student data was contingent upon the ability to link teachers with their students. Selecting the teachers to be involved in the study was done by first establishing the pool of eligible student results. Eligible results were those for students who had taken the OAT and who were included in the school's 2007 accountability report. Because data between teachers and students were linked, special steps were taken to ensure anonymity (see Appendix C).

Eligible student data. The investigator worked with the Ohio Educational Management Information System (EMIS) coordinator in each district to devise a list of students with eligible results. The investigator created a custom report for each district's value-added data base that extracted test and demographic records of students with disabilities in grades 4-8 with 2007 reading scores on the OAT. The EMIS coordinator

verified that the students appeared on the Where Kids Count report for the 2006-2007 school year. Verified student data were transferred into an Excel file with each student's data contained in a single record. Students were identified by the assigned state ID. The EMIS coordinator created and kept a code sheet linking student names to ID codes for use by the directors of special education.

Selecting teachers. The directors of special education reviewed the lists of students with eligible results and generated a list of 73 currently employed teachers who had any of the students on their caseloads for the 2006-2007 school year. Data on students whose teachers no longer worked in any of the districts was discarded. The teachers on the lists generated by the directors of special education were recruited for the study.

Recruitment procedures included email invitations and personal meetings. At the request of several of the districts, the investigator met with staff to explain the study. This option was made available to all districts. Teachers were supplied with a copy of the study information sheet outlining the project and potential benefits or consequences of participation approved by the IRB. Written consent was obtained from 62 teachers.

Teachers were given the option of taking the TSES online or on paper. The online version of the survey was provided on a secure website via an easy-to-use survey software program called Survey Monkey. The survey included a request for demographic information such as total years of experience, number of years in current position, type of license, and the name of the college where they were trained for special education. Teachers were also asked to submit their Praxis II or their NTE scores. Information on the amount of coursework each teacher had in special education was gathered by

examining transcripts maintained in the teachers' personnel files. Data on License Area and verification of the participant-supplied demographic data was secured during the transcript review.

Linking the data. Special steps were taken to ensure anonymity for teachers and students when linking the data (see Appendix C). After all teacher data had been collected and entered into an electronic file for each district, the researcher provided two copies of the file to the director of special education for the respective districts. One of the copies was archived at the school district as a backup in case of a data loss and the other was designated as the working file. At this point in the process the researcher no longer had possession of any teacher data.

The directors then randomly assigned a unique ID code from a list of codes provided by the researcher to each teacher's record in the working file. Using the code sheets created by the EMIS coordinators, the directors entered the teacher ID codes on the corresponding student data records. The directors then removed the teachers' names from the working teacher file and returned the working file and the student file to the researcher. Upon receipt of the teacher working file and verification of its completeness, the school district destroyed the backup copy. The remaining data analyses were conducted with ID codes linking students with instructors, but without the knowledge of any of the teachers' or students' identities. Teachers were made aware in the recruitment process of the use of this procedure to maintain confidentiality. The linking process resulted in 55 teachers linked to 519 student records. Seven teachers were not linked because they did not teach reading or did not have any students in grades 4-8.

Data Analysis

Answering research questions that ask to what degree predictor variables influence outcomes, such as those posed at the beginning of this chapter, is often done through the use of regression analysis. However, using such a technique in this study was not adequate because students were organized, or nested, within classrooms meaning students of a particular teacher may have been more similar than students in the study in general (Tabachnick & Fidell, 2007). A multiple regression analysis conducted on students nested within classrooms may have led to an underestimation of the standard error and a subsequent Type I error (Raudenbush & Bryk, 2002; Rethinam, Pyke, & Lynch, 2008; Schreiber & Griffin, 2004). To achieve a more accurate estimate of the standard error and avoid a judgment error on the significance of the results, an organizational linear mixed model (LMM) was employed to analyze the data (Tabachnick & Fidell, 2007).

Linear Mixed Modeling

LMM is a statistical analysis procedure that accounts for the variance in scores on multiple levels. This study used a mixed model with a simple random effects intercepts-only, two-level design. The level-1 effects, or person-level effects (Raudenbush & Bryk, 2002), were the student variables' effect on reading gain scores. The level-2 effects, or organizational effects, were the effects of teacher variables on those gains. Figure 1 is a model of how these variables potentially interact as they affect student performance. The level-1 analysis included the variables of Gender, SES, Ethnicity, and Disability. The level-2 analysis included the teacher variables of College Selectivity, License Type, License Area, Coursework, and Teacher Self-Efficacy. Experience (at level 2) and

NCE_2006 (at level 1) were included in the model as covariates to control the effects of teaching experience and prior student achievement.

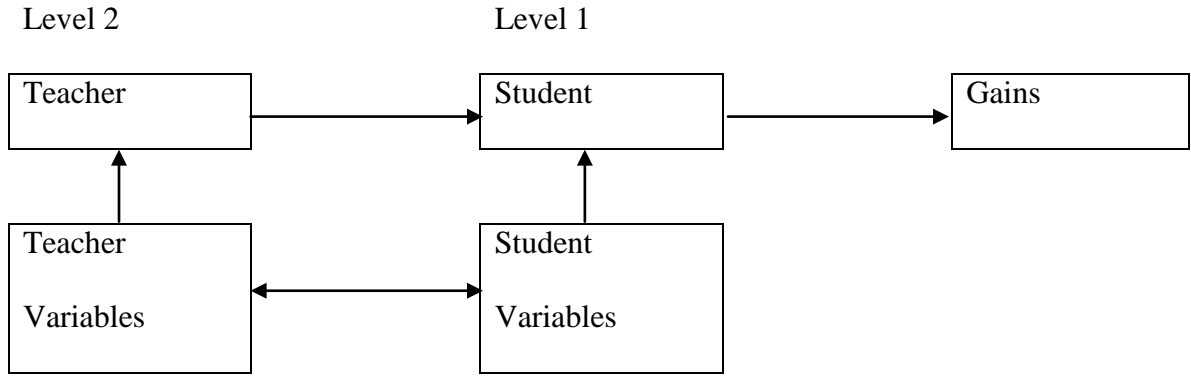


Figure 1. Conceptual model of the combined effects of student and teacher variables on achievement gain.

LMM can be thought of as a multiple regression nested within a multiple regression where the outcomes of the level-2 analysis are the slopes and/or intercepts of the level-1 analysis (Raudenbush & Bryk, 2002; Wayne & Youngs, 2003). In other words, the organizational effects, or in this case the teacher effects, may have an impact on the average gains of the students in each class (intercepts) and on the degree to which the student variables influence gains (slopes). The organizational impact can be accounted for and modeled. With that in mind, the level-1 regression model accounting for the influence of student-level variables was initially specified as:

$$Y_{ij} = \beta_{0j} + \beta_{1j}X_{1ij} + \beta_{2j}X_{2ij} + \beta_{3j}X_{3ij} + \beta_{4j}X_{4ij} + \beta_{5j}X_{5ij} + r_{ij}, \text{ where}$$

$$X_1 = \text{Gender}$$

$$X_2 = \text{SES}$$

$X_3 = \text{Ethnicity}$

$X_4 = \text{Disability}$

$X_5 = \text{NCE}_{2006}$, and

r_{ij} = the error unique to each student

Assuming that the intercept (β_0), or the main effect within the classroom, varied based on teacher variables and also as a function of a unique teacher effect (u_0). The model, then, for the intercept at level 1 that accounts for teacher effects was initially specified as:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}Z_{1j} + \gamma_{02}Z_{2j} + \gamma_{03}Z_{3j} + \gamma_{04}Z_{4j} + \gamma_{05}Z_{5j} + \gamma_{06}Z_{6j} + u_{0j} , \text{ where}$$

$Z_1 = \text{College Selectivity}$

$Z_2 = \text{License Type}$

$Z_3 = \text{License Area}$

$Z_4 = \text{Coursework}$

$Z_5 = \text{Teacher Self-Efficacy}$

$Z_6 = \text{Experience, and}$

u_{0j} = the error unique to each teacher

Because this is a random intercept only model, the remaining coefficients are defined as:

$$\beta_{1j} = \gamma_{10}$$

$$\beta_{2j} = \gamma_{20}$$

$$\beta_{3j} = \gamma_{30}$$

$$\beta_{4j} = \gamma_{40}$$

$$\beta_{5j} = \gamma_{50}$$

Substituting the terms in the second equation for the β_0 in the first equation results in an equation modeling the random effect of teacher and the fixed effects of the student variables:

$$Y_{ij} = \gamma_{00} + \gamma_{01}Z_{1j} + \gamma_{02}Z_{2j} + \gamma_{03}Z_{3j} + \gamma_{04}Z_{4j} + \gamma_{05}Z_{5j} + \gamma_{06}Z_{6j} + \beta_{1j}X_{1ij} + \beta_{2j}X_{2ij} + \beta_{3j}X_{3ij} + \beta_{4j}X_{4ij} + \beta_{5j}X_{5ij} + u_{0j} + r_{ij}$$

Before testing these models, an analysis of covariance (ANCOVA) was conducted to ascertain whether significant variance in Reading Gain existed at either level by fitting the data to the fully unconditional, or null, model (Raudenbush & Bryk, 2002). The analysis began with portioning the variance of the gain scores into the basic components of student-level variance and teacher-level variance. The portioning is equivalent to a one-way random-effects ANCOVA and allowed the researcher to measure the extent to which Reading Gain varied across teachers. The null model included an intercept for each teacher and an error term for each student within each teacher's class. The model is represented as follows:

$$Y_{ij} = \beta_{0j} + r_{ij}$$

Where Y_{ij} = the reading gain for student i in teacher j 's class, β_{0j} = the intercept for teacher j , and r_{ij} = the error associated with student i in teacher j 's class. At the teacher level, the model is represented:

$$\beta_0 = \gamma_{00} + u_{0j}$$

Where γ_{00} = the overall teacher mean and u_{0j} = the error associated with teacher j 's class.

Combining these equations forms the model:

$$Y_{ij} = \gamma_{00} + u_{0j} + r_{ij}$$

The results from the analysis of the null model were then used as a starting point for the remainder of the model analyses. The results are reported in chapter 4.

CHAPTER 4: RESULTS

This chapter presents the findings of the data analysis. First, the variables used in the study are described. Descriptive statistics on student and teacher data are included. Next, findings for research questions are presented.

Teacher Data

Descriptive data for the teacher variables are presented in this section and summarized in corresponding tables. Table 2 contains a summary of the continuous variables collected on the teachers: The amount of special education coursework completed, teaching experience, scores on the Teachers' Sense of Efficacy Scale (TSES), and class size. Although the mean hours of Coursework was over 23, there were 15 teachers (27.3%) who had less than the typical 18 hours required in many licensure programs. With an average of 14.65 years of teaching experience, the teachers in the sample were representative of the national trend (National Center for Education Statistics, 2005). Class size represents the number of students for which each teacher provided reading instruction in grades 4-8. Although the number of students each teacher had for reading varied dramatically from 2 to 23, the total students per class was higher and less variable.⁴ The TSES mean of 175.24 and standard deviation of 18.47 translate into a mean of 7.30 per item with a .77 standard deviation, indicating that the scores were clustered near the top of the range. These item statistics are consistent with the studies on the TSES (Heneman, et al., 2006; Tschannen-Moran & Hoy, 2001). A visual check of the distributions of these variables as well as a calculation of the Kolmogorov-Smirnov test

⁴ The data were analyzed with the two groups of 2 students excluded and the significance of the factors in the model was unchanged; therefore the groups of 2 were retained.

for normality indicated no problem with the assumption of normality for all of them except Experience.

Table 2

Continuous Teacher Variables^a

Variable	Minimum	Maximum	<i>M</i>	<i>SD</i>
Coursework	4	60	23.85	11.82
Experience	2	36	14.65	10.00
Self-Efficacy	119	205	175.24	18.47
Class size	2	23	9.44	4.51

^a n=55

The categorical variables of College Selectivity, License Area, and License Type are summarized in Table 3. A majority of teachers (69.1%) received their special education training at an institution of higher education (IHE) with admission standards ranked by Barron's Profiles of American Colleges (Buono, 2008) as Competitive. The smallest proportion of teachers attended an IHE ranked as Non Competitive (5.5%). This distribution of teachers over Barron's selectivity categories approximates the one for all students found by Hess et al. (2009). Because there was only one teacher who attended a school in the Highly Competitive selectivity category, the categories of Very Competitive Plus and Highly Competitive were combined. A plurality of teachers (38.2%) held a teaching license in the cross-categorical area of Mild/Moderate. The older, more traditional license areas of Cognitive Disabilities (CD) and Learning Disabilities (LD) accounted for the remainder of the teachers. Nearly one-fourth (23.6%) of the teachers had licensure in CD and LD.

Table 3

Categorical Descriptive Teacher Variables

Variable	Frequency	% of total
College Selectivity		
Noncompetitive	3	5.5
Competitive	38	69.1
Very competitive	9	16.4
VCP and HC	5	9.1
License Area		
MM	21	38.2
CD	7	12.7
LD	14	25.5
CDLD	13	23.6
Coursework groups		
< 18	15	27.3
> 17	40	72.7

Student Data

Descriptive data for the student variables are presented in this section and summarized in corresponding tables. Demographic student data are contained in Table 4. The majority of students in the study were white (89.2%) and were male (61.0%). Over half (54.8%) participated in the federal free or reduced lunch program. The students were distributed across disability categories in a manner consistent with national trends (National Center for Education Statistics, 2007) with 70.8% of the students falling in the LD category, 13.2% in the CD category and 3.2% in the Emotional Disabilities (ED) category.

Table 4

<i>Student Demographics</i>		
Variable	Frequency	% of total
Disability		
Cognitive	61	13.2
Emotional/Behavioral	15	3.2
Learning	327	70.8
Other Health Impaired	38	8.2
Low Incidence	21	4.5
Grade		
4	65	14.1
5	90	19.5
6	100	21.6
7	109	23.6
8	98	21.2
Ethnicity		
African American	20	4.3
Hispanic	1	0.2
Mixed race	29	6.3
White	412	89.2
Male	282	61.0
Free lunch program eligible	253	54.8

Table 5 summarizes the distribution of students across the categorical teacher variables. Students are grouped by those with teachers having more than 17 semester hours of coursework and those with teachers having less than 18. The distribution of students across the categories within the teacher variables of College Selectivity, Coursework groups, and License Area closely approximated the distribution of the teachers across those same categories (see Tables 2 and 5). This increases confidence that, despite the wide range of class size, the student sample is representative of the teacher characteristics studied.

Table 5

Distribution of Students Over Teacher Variables

Variable	Frequency	% of total
Coursework groups		
< 18	124	26.8
> 17	338	73.2
License Area		
MM	186	40.3
CD	51	11.0
LD	115	24.9
CD & LD	110	23.8
College selectivity		
Noncompetitive	26	5.6
Competitive	298	64.5
Very Competitive	100	21.6
VCP and HC	38	8.3

Missing scores can be an issue in accountability measures (Rubin, et al., 2004).

Little and Rubin (2002) argue that ignoring missing cases is only acceptable when the missing data are missing completely at random. With the tendency for the missing scores to be from students who do not do well on the exams, it is widely accepted that the absence of their scores result in higher mean scores. There were 57 students (11%) in the dataset that did not have gain scores due to not having a 2006 NCE score available. The special population upon which this research was done helps to mitigate the effect of the missing scores. Arguably, all the students included in the sample fall into the category of students who tend not to do well on exams. Demographics of the students with missing data were compared to the overall sample and found to be similar, further supporting this argument.

This study comprised four research questions. Two analyses were conducted to examine those questions. The following sections present the findings of each of those analyses. Data supporting the assumptions of normality for the analyses are included in Appendix D.

ANCOVA

The first research question posed was whether differences in reading gains for students with disabilities are dependent on teacher. The model used to describe teacher effect was:

$$Y (\text{Reading Gain}) = B (\text{2006 NCE score}) + X (\text{Reading Teacher})$$

ANCOVA was conducted using Reading Gain as the outcome variable, Reading Teacher as the explanatory variable, and the NCE score from 2006 as the covariate. The assumptions of normality, homogeneity of variance, and linearity were examined in the analysis.

Examination of normality for the outcome variable was initially made through a visual check of the graphed data. Figure D1 represents the distribution of the variable Reading Gain. It appears approximately normal and possibly leptokurtic. The skewness (-.198) and kurtosis (.795) statistics were examined to further verify the normality of the data (see Table D1). These two statistics were converted to z scores and compared to a normal distribution. The converted skewness score ($z_{\text{skewness}} = -1.74$) fell within normal limits and supported the assumption of normality; however, the converted kurtosis score ($z_{\text{kurtosis}} = 3.50$) described a leptokurtic distribution. The Kolmogorov-Smirnov test for normality further bolstered the assumption of normality, yielding a nonsignificant result ($p = .073$).

The model was significant ($F_{(54, 406)} = 2.616, p < .001$). Levene's test for the homogeneity of variance was not significant ($F_{(54, 407)} = 1.260, p = .113$). The results suggest that after controlling for previous achievement, significant differences in reading gains exist among teachers.

Linear Mixed Model

The remaining research questions explored the relationship of teacher and student characteristics to the outcome of reading gains. Generally, questions such as these can be addressed using a GLM procedure such as fixed-effects analysis of variance (Tabachnick & Fidell, 2007). However, it is likely that reading gain scores are biased within teacher; therefore a linear mixed model (LMM) using both random and fixed effects was used to analyze the data (Hox, 2002). Using LMM necessitated several analytic procedures, which are discussed followed by findings.

Assumptions

As with any statistical method, LMM is based on several assumptions if results are to be generalized to a wider population. LMM does not assume independent observations; rather, it assumes intraclass correlation. In this case the assumption is that students within classes (Reading Teacher) will have correlated errors. LMM does assume that the reading teachers in the study are a random sample of all possible teachers.

Multicollinearity was evaluated by a perusal of the correlation matrix and collinearity diagnostics generated by SPSS. The categorical variables were dummy coded and a multiple regression analysis was conducted to generate the matrix and statistics. A visual scan of the correlations in Table D2 revealed no highly correlated variables. The highest correlations existed between Experience and the License Area of LD (.452),

Experience and the College Selectivity category of Very Competitive (.440), and License Type and Coursework (-.437). Collinearity diagnostics (see Table D3) revealed that none of the dimensions had a variation inflation factor (VIF) near 10 (Myers, 1990); however the average VIF (1.712) was greater than 1, suggesting that multicollinearity may have biased the regression model (Bowerman & O'Connell, 1990). The tolerance statistic values ranged from .397 to .867, which were well above the .200 threshold suggested by Menard (1995). Taken together, these results suggest that the assumption of the absence of multicollinearity can reasonably be made.

It is assumed that the relationship between each of the predictor variables and the outcome variable is linear. This assumption was investigated visually by constructing scatterplots and examining the distribution of the plots. Figure D2 is the resulting scatterplot of the standardized predicted value and the standardized residuals of the outcome variable. The observed patterns do not indicate problem with the linearity assumption.

The normal distribution of the residuals was checked by the visual inspection of a histogram (see Figure D1) and P-P plot (see Figure D3) of the residuals. The histogram shows a reasonable approximation of the normal curve and the graphed plot points lie along a straight line. Two of the predictor variables, Coursework and Teacher Self-Efficacy, were continuous and were also graphed (see Figures D4 and D5). Both of the variables approximated a normal curve, with Coursework somewhat positively skewed and scores from the TSES negatively skewed. These results indicate normally distributed errors.

Homoscedasticity, or homogeneity of variance, occurs when the variance of the residuals is constant at each level of the predictor variables. The scatterplot in Figure D2 reveals the points randomly dispersed around the mean of zero. This is indicative of equal variances. Outliers were examined by inspecting the plot and by running the Casewise diagnostics. Three data points were outside the 3 *SD* bound, but were kept in the dataset as there was no theory-based justification to remove them.

Analytic Procedures

As suggested by Hox (1995), the null model was analyzed and the results were used to establish a baseline for testing the significance of subsequent models that included fixed effects. The null model in this random intercept mixed model included an intercept for each teacher and an error term for each student within each teacher's class. The model is represented as follows:

$$Y_{ij} = \beta_{0j} + r_{ij}$$

Where Y_{ij} = the reading gain for student i in teacher j 's class, β_{0j} = the intercept for teacher j , and r_{ij} = the error associated with student i in teacher j 's class. In this analysis, the Wald statistic (Field, 2009) produced for the null model indicated the random effect of Reading Teacher was significant (Wald $Z = 2.518$, $p = .012$). In other words, the teacher had a statistically significant effect on reading gain.

The full model. In the full model, the variable Reading Teacher was entered as a random effect while student variables (i.e. Disability, Gender, Ethnicity, SES, and NCE_2006) and teacher variables (i.e. College Selectivity, License Type, License Area, Coursework, Teacher Self-Efficacy, and Experience) were entered into the model as fixed effects. Reading Gain was used as the outcome variable and the NCE_2006 score,

the TSES score, Experience, and Coursework were identified in the model as covariates. The maximum likelihood (ML) method of estimation was employed to allow for model comparisons (Snijders & Bosker, 1999).

As is common in LMM, all continuous level-1 predictor variables were centered (Garson, 2009). The covariate NCE_2006 has no meaningful value of zero; therefore, it was centered around the grand mean. Centering around the grand mean increases statistical stability by reducing multicollinearity (Tabachnick & Fidell, 2007).

Comparing the null model to the full model. The -2 Log Likelihood (-2LL), a statistic used to indicate goodness of fit for LMM, was 3822.122 for the null model and 3622.073 for the full model. The magnitude of the -2LL statistic has no meaning on its own; rather it is used to compare the goodness of fit between models. The statistic uses a smaller-is-better form, indicating that the full model was a better fit than the null. A chi-square analysis of the difference in scores found the difference to be significant ($\chi^2(11) = 200.049, p < .001$), suggesting that the full model is a significantly better predictor of the outcome variable.

Findings

Comparing models dictates the use of ML estimation; however, restricted maximum likelihood (REML) is another method used in LMM because it helps to reduce bias, especially when random effects are included in the model and when the number of level-2 groups is small (Hox, 2002; Kreft & De Leeuw, 1998). Therefore, the full model was run again using the REML method of estimation. The random effect of Reading Teacher was again found to be significant in the full model (Wald $Z = 2.388, p = .017$),

suggesting that the teacher has an effect on student achievement regardless of the effect of the student variables. The findings included are based on the REML model.

Accounting for variance. The total variance accounted for by the random effect of Reading Teacher was calculated by dividing the variance estimate for Reading Teacher (τ^2) by the sum of the variance components for the between group effect and the within group effect ($\tau^2 + \sigma^2$). Substituting the acquired variances for the symbols, $24.502/(24.502 + 140.419)$, the resulting ratio indicated that the teacher accounted for 14.9% of the variance in Reading Gain, an amount commensurate with the findings of other studies as reported by Nye et al. (2004) in their review of the size of teacher effects. The same formula is used to calculate the intraclass correlation.

$$\rho = \tau^2 / \tau^2 + \sigma^2$$

In this instance, an intraclass correlation of .15, suggested that LMM was appropriate to use in the analysis (Snijders & Bosker, 1999).

Fixed effects. Table 6 contains the results for all of the fixed effects. The fixed effects of Disability Group ($F_{(4, 402.720)} = 3.796, p = .005$), College Selectivity ($F_{(3, 35.958)} = 4.039, p = .014$), and NCE_2006 ($F_{(1, 439.573)} = 218.053, p < .001$) were found to be significant, suggesting that these factors are meaningful predictors of student gain in reading. The remainder of the fixed effects were not significant and it was interesting to note that the TSES ($F_{(1, 33.444)} = .425, p = .519$) had very little influence on Reading Gain.

Estimates of the coefficients for the fixed effects are displayed in Table 7. the coefficients for License Area are relative to teachers holding licensure in both LD and CD. College Selectivity coefficients are relative to teachers who attended schools in the VCP/HC category and Disability coefficients are relative to the performance of students

Table 6

Fixed Effects in the Full Model

Source	<i>df</i>		<i>F</i>	<i>p</i>
	Numerator	Denominator		
Intercept	1	39.148	1.983	.167
Gender	1	422.384	1.367	.243
SES	1	436.750	3.147	.077
License Area	3	36.461	.373	.773
College Selectivity	3	35.958	4.039	.014
License Type	1	34.237	.721	.402
Disability	4	402.720	3.796	.005
Ethnicity	1	431.710	.175	.676
Coursework	1	38.262	3.649	.064
TSES	1	33.444	.425	.519
Experience	1	40.783	.557	.460
NCE_2006	1	439.573	218.053	.000

in the LI group. Although not significant, the variable Coursework ($F_{(1, 38.262)} = 3.649$, $p = .064$) had a negative coefficient (-.171), suggesting that more special education coursework on the part of the teacher depresses student academic gain. This curious finding was further examined by dividing the number of hours of coursework into four evenly distributed groups of students and reanalyzing the model with the fixed effect of Coursework Group entered as a categorical variable. The overall results were similar; however, Coursework Group ($F_{(3, 32.947)} = 2.907$, $p = .049$) was significant. In this model, teachers with 4-14 semester hours of special education coursework (group 1; $t = 2.187$, $p = .035$) and those with 20-30 hours (group 3; $t = 2.715$, $p = .011$) had significantly higher gain scores than those with the most training (group 4) (see Table 8).

Table 7

Coefficient Estimates of Fixed Effects in the Full Model

Parameter	Estimate	SE	df	t	p	95% CI	
						LL	UL
Intercept	22.140	12.148	45.231	1.823	.075	-2.324	46.603
License Area							
MM	2.951	2.992	33.770	.986	.331	-3.130	9.032
CD	2.345	3.305	36.636	.709	.483	-4.354	9.044
LD	1.425	2.741	36.115	.520	.606	-4.132	6.983
College Selectivity							
NC	-6.044	5.117	36.762	-1.181	.245	-16.415	4.326
C	-11.883	3.558	40.868	-3.340	.002	-19.070	-4.696
VC	-10.149	4.164	35.558	-2.437	.020	-18.598	-1.700
Disability							
CD	-11.668	3.243	422.934	-3.598	.000	-18.042	-5.294
ED	-6.934	4.652	354.044	-1.490	.137	-16.083	2.216
LD	-5.911	2.851	433.543	-2.073	.039	-11.515	-.307
OHI	-6.039	3.359	425.996	-1.798	.073	-12.642	.563
Standard License	2.929	3.450	34.237	.849	.402	-4.080	9.939
Gender (F)	1.403	1.200	422.384	1.169	.243	-.956	3.762
SES (No lunch)	2.224	1.254	436.750	1.774	.077	-.240	4.689
Nonwhite	.839	2.007	431.710	.418	.676	-3.106	4.785
Coursework	-.171	.090	38.262	-1.910	.064	-.353	.010
TSES	-.033	.051	33.444	-.652	.519	-.137	.071
Experience	-.101	.136	40.783	-.746	.460	-.376	.173
NCE_2006	-.564	.038	439.573	-14.767	.000	-.639	-.489

The lack of influence on the part of Teacher Self-Efficacy was further investigated. A factor analysis was conducted on the TSES results to examine whether this administration produced a factor structure similar to that found by previous

Table 8

Estimated Coefficients for Coursework Groups

Coursework Group	<i>n</i>	Range	Estimate	<i>SE</i>	<i>df</i>	<i>t</i>	<i>p</i>
1	12	4-14	6.860	3.137	35.714	2.187	.035
2	13	15-19	4.056	2.505	34.020	1.619	.115
3	14	20-30	7.463	2.749	31.964	2.715	.011
4	16	31-60	0 ^a				

^aThis parameter is set to zero because it is redundant.

validation studies (Heneman, et al., 2006; Tschannen-Moran & Hoy, 2001). Exploratory factor analysis using principal axis factoring with varimax rotation was used because it had been used in the comparison studies. The three factors of student engagement, instructional strategies, and classroom management present in the validation studies were found. Eigen values associated with the factors were similar to those reported by Tschannen-Hoy and Moran (see Appendix E). An investigation of the effect of each factor was undertaken by running the model using each of the three factors as fixed effects in place of the TSES. None of the factors emerged as significant.

The estimated means for Reading Gain for the disability groups are listed in Table 9. Students with CD were estimated to score nearly 2.5 NCEs lower in 2007 than they did in 2006 ($M = -2.447$, $SE = 2.630$). Students with ED, Learning Disabilities (LD), Other Health Impairments (OHI), and those in the Low Incidence (LI) categories were expected to improve their scores. Students with LI had the highest estimated gain ($M = 9.220$, $SE = 3.453$).

The estimated means for Reading Gain for students by College Selectivity are displayed in Table 10. Students whose teachers attended a college in the combined

Table 9

Estimated Means by Disability Group in the Full Model

Disability Group	<i>n</i>	<i>M</i>	<i>SE</i>	<i>df</i>	95% CI	
					LL	UL
CD	61	-2.447 ^a	2.630	88.336	-7.674	2.779
ED	15	2.287 ^a	4.383	162.839	-6.368	10.941
LD	327	3.309 ^a	2.137	43.991	-.998	7.616
OHI	38	3.181 ^a	2.913	129.445	-2.582	8.944
LI	21	9.220 ^a	3.453	208.841	2.414	16.027

^aCovariates appearing in the model are evaluated at the following values: Coursework = 22.51, TSES = 176.09, Experience = 14.43, NCE_2006 = .1717.

category of Very Competitive Plus/Highly Competitive had the highest estimated mean gain ($M = 10.129$, $SE = 3.725$) and those whose teachers attended colleges rated as Competitive had the lowest mean gain ($M = -1.754$, $SE = 2.323$).

Table 10

Estimated Means of College Selectivity Categories in the Full Model

College Selectivity	<i>M</i>	<i>SE</i>	<i>df</i>	95% CI	
				LL	UL
Non Competitive	4.085 ^a	4.419	39.926	-4.848	13.017
Competitive	-1.754 ^a	2.323	68.283	-6.389	2.881
Very Competitive	-.020 ^a	3.168	41.636	-6.414	6.374
VCP and HC	10.129 ^a	3.725	46.521	2.634	17.624

^aCovariates appearing in the model are evaluated at the following values: Coursework = 22.51, TSES = 176.09, Experience = 14.43, NCE_2006 = .1717.

A pairwise comparison using the Sidak adjustment for comparison of multiple means was made on the fixed effects of Disability, Ethnicity, Gender, SES, License Area, License Type, and College Selectivity. The level-1 variable of Disability had significant

differences among its categories (see Table 11). Mean differences between students with CD and LD (MD = -5.757, $p = .024$) and between students with CD and LI (MD = -11.668, $p = .004$) were significant.

Table 11

Mean Differences (MD) Between Disability Groups

Disability Group		MD	SE	df	p_a
CD	ED	-4.734	4.089	302.050	.942
	LD	-5.757*	1.886	441.793	.024
	OHI	-5.629	2.682	433.150	.310
	LI	-11.668*	3.243	422.934	.004
ED	LD	-1.022	3.791	264.070	1.000
	OHI	-.894	4.267	308.275	1.000
	LI	-6.934	4.652	354.044	.771
LD	OHI	.128	2.184	439.941	1.000
	LI	-5.911	2.851	433.543	.326
OHI	LI	-6.039	3.359	425.996	.531

^aAdjustment for multiple comparisons: Sidak.

* $p < .05$

Mean differences for the level-2 variable of College Selectivity were also significant (see Table 12). The difference between the combined category of Very Competitive Plus/Highly Competitive and Competitive (MD = 11.883, SE = 3.558, $p = .011$) was significant.

Interactions. Before eliminating nonsignificant fixed effects from the model, the full model was checked for interactions between variables. Because Disability was a variable of interest in the study and because it yielded a significant effect, its interaction

with each of the other variables was analyzed. The full model was run repeatedly with a different variable juxtaposed to Disability in each iteration. No significant interactions were discovered (see Appendix F).

Table 12

Mean Differences (MD) Between College Selectivity Categories

College Selectivity Category		MD	SE	df	p ^a
Non Competitive	Competitive	5.839	4.170	34.522	.674
	Very Competitive	4.105	4.894	34.230	.957
	VCP and HC	-6.045	5.117	36.762	.815
Competitive	Very Competitive	-1.734	2.963	33.925	.993
	VCP and HC	-11.883*	3.558	40.868	.011
Very Competitive	VCP and HC	-10.149	4.164	35.558	.114

^aAdjustment for multiple comparisons: Sidak.

* $p < .05$

Covariates. Experience was somewhat surprisingly a nonfactor. Recent studies indicate a significant effect of teacher experience on achievement (Huang & Moon, 2009; Rockoff, 2003; Vanderhaar, et al., 2006); however, in this study the coefficient for years of experience was nonsignificant and slightly negative (-.101) suggesting that experience did not affect reading gains. Teaching experience has been found to have a nonlinear relationship with student achievement (Croninger, et al., 2007; Summers & Wolfe, 1975). To examine the possibility of a nonlinear relationship, teachers were grouped into three groups; those with 0-2 years of experience, 3-4 years, and five or more (see Croninger et al.) and the analysis was conducted again entering Experience as a categorical variable. The results were minimally different from the full model analysis (see Appendix G).

The covariate for prior student achievement was significant in all models. There was a strong correlation between the 2006 and the 2007 NCE scores ($r = .559, p < .001$). The correlation between the gain scores and the 2006 NCE scores was equally strong and negative ($r = -.553, p < .001$), meaning that students with the largest gains were those with the lowest 2006 NCE scores.

Effect size. The statistics used to report effect size (ES) in educational research are not easily applied to multilevel modeling (Hox, 2002; Kreft & De Leeuw, 1998; Raudenbush & Bryk, 2002; Snijders & Bosker, 1999). Although there is not a consensus on reporting its ES, several techniques have been developed as a way to describe the strength of a multilevel model. Reporting the *proportion reduction in variance* is one of those techniques. The percent of reduction is found for each level by subtracting the variance of the full model from the variance of the null model and dividing the difference by the null variance. The formulae suggested by Raudenbush and Bryk for the level-1 percent is:

$$R_1^2 = \sigma^2(\text{null}) - \sigma^2(\text{full}) / \sigma^2(\text{null})$$

And for the level-2 percent:

$$R_2^2 = \tau_{00}(\text{null}) - \tau_{00}(\text{full}) / \tau_{00}(\text{null})$$

Substituting the values obtained for the symbols, the proportion reduction in variance accounted for by the factors included in the full model at level 1 was 32.7% and at level 2 was 26.7%. The reader is cautioned that this is a comparison between models and is not to be interpreted as the variance explained by the model.

Finding the Best Fit

To find the best fitting model, a testing regimen that results in the removal of noncontributing factors was employed (Hox, 1995). Using the full model as a starting point, the overall effect of each explanatory variable was examined. Each variable was systematically removed from the model and then the resulting model was evaluated using LMM. The difference in the -2LL values of the previous model and the new model was tested for significance using chi square. If elimination of the variable did not result in a significant change, the variable was removed from the model. This process was continued until all variables had been tested and the nonsignificant variables eliminated. The last variable removed from the model was Coursework, which had been significant in the first four iterations of the model ($p = .029, .026, .027, \text{ and } .037$). The final model included the variables Disability and College Selectivity.

As a final check for interactions, the best fit model was run with an interaction term of Disability X College Selectivity and was not found to be significant. Although the effect of College Selectivity had no interaction with Disability, the disability of CD had an overriding effect on College Selectivity. To further investigate, students were split into groups of those with CD and those without. The dichotomous variable of with/without CD was entered into the final model in place of the five-category variable of Disability. An interaction term between with/without CD and College Selectivity was also added and the analysis was run. With/without CD was a significant predictor, but neither College Selectivity nor the interaction term were (see Appendix H).

The resulting model representing the random intercept (Reading Teacher) with the accompanying effect of College Selectivity became:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{College Selectivity})_j + u_{0j}$$

The final model for Reading Gain includes a random intercept and one fixed effect. The model is represented as follows:

$$Y_{ij} = \beta_{0j} + \beta_1(\text{Disability})_i + r_{ij}$$

Substitution of terms yielded the following final model that includes the significant fixed effects at levels 1 & 2:

$$Y_{ij} = \gamma_{00} + \gamma_{01} z_j + \beta_1 x_{ij} + u_{0j} + r_{ij}$$

The significance levels of the fixed effects of Disability Group ($F_{(4, 417.746)} = 4.396, p = .002$), College Selectivity ($F_{(3, 40.547)} = 3.223, p = .032$), and NCE_2006 ($F_{(1, 450.972)} = 220.927, p < .001$) for the final model were similar to those of the full model.

The estimated means for the disability groups in the final model (see Table 13)

Table 13

Estimated Means of Categories Within Fixed Effects in the Final Model

Fixed Effect	<i>M</i>	<i>SE</i>	<i>df</i>	95% CI	
				LL	UL
Disability Group					
CD	-2.937 ^a	2.033	162.360	-6.952	1.077
ED	2.330 ^a	3.875	214.986	-5.309	9.969
LD	3.420 ^a	1.393	47.159	.617	6.222
OHI	2.575 ^a	2.342	242.062	-2.040	7.189
LI	8.899 ^a	3.032	369.706	2.937	14.860
College Selectivity					
Non Competitive	3.350 ^a	3.875	45.352	-4.452	11.152
Competitive	-1.105 ^a	1.375	89.928	-3.837	1.626
Very Competitive	.665 ^a	2.214	43.472	-3.798	5.128
VCP and HC	8.519 ^a	3.206	53.617	2.090	14.947

^aCovariates appearing in the model are evaluated at the following values: NCE_2006 = .1717.

were also similar to those in the full model. The CD group ($M = -2.937$, $SE = 2.033$) was again the only group with a negative value and the LI group ($M = 8.899$, $SE = 3.032$) had the highest value. The ED group ($M = 2.330$, $SE = 3.875$), the OHI group ($M = 2.575$, $SE = 2.342$), and the LD group ($M = 3.420$, $SE = 1.393$) maintained the same rank order. The values of all the groups except ED and LD were lower in the final model than the full model.

The estimated means for the College Selectivity groups in the final model also closely approximated those of the full model. The lowest value was again the Competitive group ($M = -1.105$, $SE = 1.375$) and the highest was the combined group of Very Competitive Plus/Highly Competitive ($M = 8.519$, $SE = 3.206$). The values increased in the Competitive and Very Competitive ($M = .665$, $SE = 2.214$) groups and decreased for the Non Competitive ($M = 3.550$, $SE = 3.875$) and Very Competitive/Highly Competitive groups.

The pairwise comparisons made in the final model were also similar to the full model with significant mean differences between the Disability Groups of CD and LD (-6.357 , $SE = 1.814$, $p = .005$) and CD and LI (-11.836 , $SE = 3.202$, $p = .002$) (see Table 14). The combined College Selectivity category of Very Competitive Plus/Highly Competitive was higher than the Competitive category ($MD = 9.624$, $SE = 3.227$, $p = .027$). Table 15 contains the mean differences of all the College Selectivity categories.

Table 14

Mean Differences (MD) Between Disability Groups in the Final Model

Disability Group		MD	SE	df	p^a
CD	ED	-5.267	4.004	321.251	.877
	LD	-6.357*	1.814	450.313	.005
	OHI	-5.512	2.632	440.904	.313
	LI	-11.836*	3.202	431.095	.002
ED	LD	-1.090	3.750	286.971	1.000
	OHI	-.245	4.237	333.871	1.000
	LI	-6.569	4.590	372.535	.811
LD	OHI	.845	2.166	450.596	1.000
	LI	-5.479	2.823	444.803	.420
OHI	LI	-6.324	3.339	432.892	.455

^a Adjustment for multiple comparisons: Sidak.* $p < .05$

Table 15

Mean Differences (MD) Between College Selectivity Categories in the Final Model

College Selectivity		MD	SE	df	p^a
Non Competitive	Competitive	4.456	3.912	41.421	.837
	Very Competitive	2.686	4.290	39.605	.990
	VCP and HC	-5.168	4.818	42.190	.871
Competitive	Very Competitive	-1.770	2.328	36.202	.973
	VCP and HC	-9.624*	3.227	44.998	.027
Very Competitive	VCP and HC	-7.854	3.697	42.349	.215

^a Adjustment for multiple comparisons: Sidak.* $p < .05$.

The variance estimates were 23.960 for the random effect of Reading Teacher and 140.836 for the residual. Dividing the between group variance (23.960) by the sum of the between- and within-group variance components (164.796) revealed that the random effect of Reading Teacher accounted for 14.5% of the variance in reading gains (see Table 16).

Table 16

Estimates of Covariance Parameters in the Final Model

Parameter	Estimate	SE	Wald Z	p	95% CI	
					LL	LL
Residual	140.836	9.982	14.109	.000	122.570	161.824
Reading Teacher Variance	23.960	9.184	2.609	.009	11.303	50.788

CHAPTER 5: DISCUSSION

Summary of the Study

This study was conducted to assess the influence of several special education teacher characteristics on the performance of students with disabilities on high-stakes tests. The variable of interest in this study was the reading gain of students with disabilities, using the Ohio Achievement Test (OAT) for Reading. Although much has been written about the relationship between teacher effects and student outcomes on high-stakes tests, little focus has been given to students with disabilities. The teacher variables in the study included College Selectivity, Coursework, License Type, Experience, Teacher Self-Efficacy, and License Area. The effect of these variables may be tempered by student characteristics. Student characteristics included in this study were Disability, Gender, Ethnicity, and Socioeconomic Status (SES). The use of multilevel modeling made it possible to account for the nesting of students within classrooms.

It was hypothesized that there would be significant differences among teachers and that the strongest predictor of achievement would be teacher self-efficacy. It was further hypothesized that a student's disability would impact achievement. Teachers did make a significant difference in the amount of reading gain as did disability type; however, support for the hypothesis that teacher self-efficacy would be a significant factor in student achievement failed to materialize. Answers to the research questions that drove this study were briefly addressed in Chapter 4. The differential effects of teacher and student variables on reading achievement are further discussed in the findings.

Findings and implications

Four important findings were made in this study. The important role of college quality, the overriding effect of student disability, the apparent lack of significance of teacher self-efficacy, and the inconsistent contribution of teacher training all had a bearing on student achievement. Each of these findings and their implications is discussed.

The Important Role of College Quality

College Selectivity was the single teacher characteristic found to be significant in the full model and final model presented earlier. The significant effect of this variable on the performance of students with disabilities is consistent with the research on general education students by Ehrenberg and Brewer (1994), Summers and Wolfe (1975, 1977) and Rockoff et al. (2008). This finding also is similar to the findings from Ehrenberg and Brewer (1995) and Rockoff et al. on the relationship between cognitive aptitude and student achievement. Therefore, it appears that the more selective a college is, the more successful are its graduates. Although this extension has been validated in salary studies done in the corporate world (Brewer, et al., 1999; Dale & Krueger, 2002; Thomas, 2003), in the field of education such success is more appropriately defined by differential student performance than by salary.

In terms of mean performance, a progressive effect of selectivity was found to exist for the three most selective categories in the study; however, it did not hold true for the least selective category. Students whose teachers attended schools rated as Very Competitive Plus/Highly Competitive had a higher mean score than those from Very Competitive schools, who, in turn, had a higher mean score than those from Competitive

schools. Additionally, mean performance of students with teachers attending Very Competitive Plus/Highly Competitive schools was significantly higher than students whose teachers attended schools in the Competitive group. However, students with teachers from Noncompetitive schools outperformed all but the highest selectivity grouping.

The counterintuitive performance of the Noncompetitive group may be attributable to the distribution of teachers across College Selectivity categories. Just slightly more than 5% of the students involved in the study represented teachers who attended a noncompetitive college. This small number may explain the spurious result, especially recognizing that the standard error (SE) of the mean was large enough to cause concern. The noncompetitive group had the largest SE, which suggests that there was enough variation in the scores that we cannot be certain that the true score for this group was not in fact the lowest. Looking at the results without consideration of the least competitive category it becomes clear that teachers who attended more competitive universities tended to have students who made greater gains on high-stakes reading tests.

This finding has implications for schools of education as they train prospective teachers and for local school districts as they select which of the available teachers will instruct their students. Schools of education could use this finding in two ways. First, they could choose the obvious course of adjusting their admissions criteria to match that of more selective schools. Presumably, more stringent entrance requirements lead to better teachers and, in turn, to better outcomes for students with disabilities. This approach runs counter to the proposition that higher education is a value-added enterprise and suggests, as did Harvey and Green (1993), that the eventual success of college

graduates may be more dependent on the innate qualities they bring to their college experience rather than what they gain from it. It is also not supported by Aloe and Becker's (2009) meta-analysis that provides evidence that verbal ability is not the only teacher attribute essential to teaching quality. To suggest that the only way to improve the outcomes of schools of education is to improve the inputs would be tantamount to suggesting that teacher education programs are ineffectual and unnecessary.

A different, and perhaps more appropriate response would be to examine the programs provided by these more selective schools and the graduates they produce to ascertain what skills, dispositions, and attitudes they promote with the goal being to replicate their product, not their admissions process. This examination would have to go beyond the obligatory curriculum and standards review and ask the tough questions of how schools define high quality teaching and how they work with students who may not have the skill sets (academically and socially) to meet their criteria of high quality teaching. An outcome of such an examination may be that schools of education do not have to adjust their standards for admission to ensure high quality graduates; rather, that an adjustment in *design* and *delivery* of their program and the standards for *completion* is warranted (Darling-Hammond, 2006).

In a broader criticism of higher education, Carey (2010) suggests that universities need to restructure and become more transparent in their dealings with students. Among other ideas, he calls for annual "public learning audits" conducted by universities to measure how much their students are learning. He also suggests (Carey, 2009) that schools replace contact hours with professors as the way credit for a course is determined with the number of hours students have to work to achieve stated course objectives.

Adoption of such radical ideas by schools of education may assist in producing high quality graduates without raising the admission standards.

For nearly my entire career in elementary and secondary education I was involved in the hiring of teachers; for the final 10 years, staff selection was one of my principal duties. My colleagues and I, whose job it was to hire new teachers, had a sense about which colleges produced the type of teachers we wanted to recruit, but that sense was not necessarily based on evidence. We chose recruiting sites primarily because they had produced successful teachers, but there were also times we chose sites based on the favorable treatment we received as recruiters or because of a fondness for the institution unrelated to teacher training. Rigorous recruitment and hiring practices are contributors to student achievement (Darling-Hammond, 2000). Recruiting effective teachers can be a gamble, especially when hiring teachers just out of college with no teaching experience. This finding would be an asset to those recruiting new teachers. Armed with the evidence that teachers from more selective schools tend to produce better reading gains, recruiters could target their efforts.

The Overriding Effect of Student Disability

Of the four student variables used in the study, Disability was the only one with a statistically significant effect on student outcomes. The notion that disability has an effect on student achievement appears intuitive, but this finding may be a bit more complex. Unlike some studies on the effect of a disability, all of the students in this study had a disability. Therefore, this finding is an indicator of the differential effect of *type* of disability rather than the effect of the *presence* of a disability. Considering that this

differential effect was stronger than that of Gender, SES, and Ethnicity appears to add to the importance of the finding.

There was an average annual gain in reading for students in all disability groups except for those with Cognitive Disabilities (CD). Students with CD were estimated to actually lose reading achievement from 2006 to 2007. Not only did they lose ground, they were significantly behind students in the Low Incidence (LI) and Learning Disabilities (LD) categories. Had the Emotional Disabilities (ED) group been larger, a significant difference between ED and CD may have also been achieved. The largest average gain was for the LI group. Having the LI group outpace all other groups is somewhat of a surprise when the traditional definition of LI is considered; however in this study, the LI group was atypical. All of these students had disabilities that fell in categories of physical disability or modality impairment. None of them had cognitive delays, resulting in the CD group representing all students with cognitive delays.

As a primary variable of interest, Disability's effect on other variables was systematically analyzed. Although no interactions were found in the models using Disability x College Selectivity as an interaction term, it is interesting to note that the disability of CD had an overriding effect on College Selectivity. When the data were analyzed with students split into groups of those with CD and those without, having CD proved to be a significant predictor regardless of the teacher's level of college selectivity. This is important to note from a policy perspective. When a student has a cognitive impairment, the disability becomes a stronger factor in the student's achievement than the otherwise significant teacher training institution.

This finding has implications for the way students with CD are assessed and the way teachers, schools, and school districts are held accountable for their education. Considering that the outcome measure in this study was academic achievement and that students with CD have deficiencies in academic potential by definition, the results are not surprising. IDEA describes a child with CD as having “significantly subaverage general intellectual functioning” (“Individuals with disabilities education improvement act,” 2004). Why, then, are these students expected to perform on the same tests as students without disabilities? This study shows that students with CD do not perform on high-stakes tests commensurate with students with other disabilities, much less those without. It appears that very different groups of students are being treated the same way with the expectation of similar results (Johnson, et al., 2007).

It is commendable that NCLB requires states to include all children regardless of disability or disadvantage in school accountability programs. The success of all children should be accounted for; such attention to the achievement and success of students with disabilities is welcomed. However, the concern about the fairness of having students with CD participate in high-stakes testing now becomes a concern about the fairness of accountability measures based on their performance. Using the same instrument to measure accountability with all students is potentially problematic to schools and school districts (Johnson, et al., 2007). As shown in this study, students with CD, regardless of the teacher’s personal characteristics, failed to make progress on the OAT. Special education services in Ohio are delivered cross-categorically, meaning the students with CD were instructed alongside students with other disabilities and by the same teachers.

There were no apparent differences in treatment, and the only significant difference in students was their disability.

In light of these findings, current education policy may be headed in a precarious direction. The practice of using student performance on high-stakes tests for accountability is now moving into the arena of teacher evaluation (Hightower, 2010). States are introducing and enacting policies using student achievement data in teacher evaluation (Robelen, 2009; Sisk, 2010) in an effort to make them more competitive for the Obama administration's Race to the Top funds. Even the president of the nation's second largest teacher's union, the American Federation of Teachers, has called for the use of student data in teacher evaluations (N. Anderson, 2010). Using student performance for accountability purposes has merit and deserves consideration; however, when the findings of this study are considered, using test results from students with disabilities in the teacher evaluation process must be undertaken carefully. Although the inclusion of most students with disabilities may have some value, using performance data from students with CD may create an inaccurate picture of teacher quality.

The practice of including students with CD in high-stakes testing and using the results for multiple levels of accountability should be thoughtfully reconsidered. Students with CD must be held to standards that are appropriate for them and are assessed in a manner commensurate with their disability (Thurlow & Johnson, 2000). Likewise, schools and teachers should have their performance measured accurately. The findings here suggest a possible redesign of the way students with CD are assessed; perhaps they should be assessed individually in light of their Individual Education Plans. As Johnson

et al. (2007) point out, these tests were designed primarily for the general education students with little consideration as to the participation of students with disabilities.

This study was not undertaken to find an alternative assessment, consequently none is prescribed. A possible solution to the dilemma of holding students with CD to high, yet fair standards would be to lift the 2% cap on students with persistent academic disabilities and allow all students with CD to be tested with modified assessments.

The Apparent Lack of Significance of Teacher Self-Efficacy

The variable of teacher self-efficacy was of particular interest in this study and its lack of statistical significance was surprising. If this finding were considered in isolation, one might conclude that teacher self-efficacy has no effect on student achievement. This is not the conclusion this investigator reached after years of experience working with schools whose students with disabilities displayed a wide range of success. Successful students tended to be in schools that had a sense of mission. Teachers in successful schools did not easily give up on students and had the confidence that they could, and would make them successful (Brigharm, et al., 2006). It is this experience that led to the conceptualization of ownership of student success proposed in this study.

This absence of a significant finding does not seem to align with the literature either. Teacher self-efficacy studies have shown a connection between teachers' perceived efficacy and student performance (Allinder, 1995; R. N. Anderson, et al., 1988; Armor, et al., 1976; Ross, 1992; Tschannen-Moran & Barr, 2004). Studies have also shown a connection between perceived teacher self-efficacy and teacher traits and behaviors thought to be indicative of high quality teaching such as high expectations of students, enthusiasm for work, willingness to take risks in instruction, creativity,

providing more time on task for students, and a commitment to teaching (Allinder, 1994; Brownell & Pajares, 1996; Carlson, et al., 2004; Coladarci & Breton, 1991; Rockoff, et al., 2008; Wigle & Wilcox, 1998). The former group of studies referenced here took place exclusively in the general education context while studies involving special education are included in the latter group.

It is interesting to note that the studies reviewed here tend to show the strongest connection between teacher self-efficacy and student achievement when those outcomes are closely related to classroom teaching. For instance, Allinder (1995) examined the relationship between teacher self-efficacy and student outcomes in classrooms using curriculum-based measurement. And Ross (1992) conducted his study of teacher self-efficacy and student achievement in social studies classrooms using outcomes established by the local school district based on state standards. In contrast, Tschannen-Moran and Barr's (2004) study on collective teacher efficacy used high-stakes tests as the student outcome measure and found the weakest connection to teacher self-efficacy.

The trend of teacher self-efficacy to be more closely connected to student achievement on classroom assessments may help explain some of the lack of significance for teacher self-efficacy in this study. It may also call into question the appropriateness of using high-stakes tests as measures of special education teacher quality. Overall, students with disabilities score lower on high-stakes assessments and tend to make slower progress than do general education students (Chudowsky & Chudowsky, 2009). High-stakes assessments such as the OAT may not be sensitive enough to recognize the incremental progress made by students with disabilities.

Dismissing the role of teacher self-efficacy in promoting academic achievement for students with disabilities may be premature, despite its lack of significance in the models specified in this study. When this study is considered along with the extant literature, this nonfinding could imply that although teacher self-efficacy alone is not sufficient for producing achievement gains, it acts as a mediator for other teacher characteristics. Similar to the finding of Rockoff et al. (2008), the combination of self-efficacy with other factors may be significant. It may be that self-efficacy makes a difference when teachers possess the minimum requisite skills to provide the instruction necessary to make students successful, implying that teacher training programs should include a balance of rigorous content area coursework and meaningful pedagogy.

The Inconsistent Contribution of Teacher Training

Three variables represented the domain of teacher training in this study: License Type, License Area, and Coursework. All of these variables are directly related to teacher training. The effects of these variables proved to be internally inconsistent in this study as well as inconsistent with the same variables in external studies.

The literature contains examples where each of these variables is shown to be a significant predictor of student achievement. Studies by Darling-Hammond (1990), Darling-Hammond et al. (2005), Goldhaber and Brewer (1997a, 2000), McDiarmid and Wilson (1991) and Palardy and Rumberger (2008) demonstrated the value of having a teaching credential. These studies confirm the connection between a fully credentialed teacher and student achievement. The same strength of connection was not found for the variable License Type in this study. This categorical variable may have been somewhat misleading as it did not allow for differential measurement of teachers who were close to

receiving their full credential. The dichotomous nature of this variable assumed the teacher was either fully licensed or not. Those who had partially completed the requirements for licensure appeared the same as those with no preparation. Although the variable was not significant, it did produce a coefficient that indicates fully credentialed teachers make a positive contribution to student achievement.

The variable License Area captured the effect of disability-specific licensure on student achievement. It was postulated that licensure designed to equip a teacher to work with students with a specific disability might lead to higher student gains as was found in studies on the relationship of content-specific licensure at the secondary level (Darling-Hammond, 2000; Goldhaber & Brewer, 1997a, 2000; Hawk, et al., 1985). The results did not support such a theory. Rather, the relationship appears to be inconclusive as was found in studies on the effects of elementary certification (Croninger, et al., 2007; Rowan, et al., 2002). In fact, the findings are somewhat counterintuitive (see Appendix D). Teachers with an LD only license had the highest average gain for students with CD and the lowest average gain for students with LD. It is also noteworthy that teachers with CD only licenses had the lowest average gains for students with CD and the highest for students with Other Health Impairments (OHI). The introduction in the early 1990s of the cross-categorical license (Mild/Moderate) may have confounded these results. Ohio developed this newer category to prepare teachers to work with students in all high incidence disability categories especially in inclusive environments.

Finally, the variable Coursework behaved differently depending on how it was analyzed. When treated as the total number of credit hours, it was not significant. But, when teachers were divided into four groups based on accumulated credit hours, there

were significant differences between the groups. Interestingly, it was the group with the most amount of training that had the smallest (negative) coefficient. Based on these results, there appears to be a point of diminishing returns for special education coursework similar to that found by Monk and King (1994) for science coursework. This study suggests that point is somewhere around 30 semester hours, exclusive of field experience.

The implications from the information gained on teacher training effects appear rather broad. These findings suggest that the practice of teacher licensing has value and that pedagogical coursework influences student achievement in a nonlinear fashion. There appears to be a limit to the benefit received from formal special education courses. Schools of education should consider designing parsimonious teacher education programs, requiring an optimum number of rigorous, integrated courses in pedagogy as suggested by Darling-Hammond (2006). It may serve them well to not fall prey to the “more is better” approach to program design and avoid the temptation to create a new course in response to every new challenge. These results also lend credence to the movement away from the traditional practice of basing teacher compensation solely on education and experience. Continually increasing a special education teacher’s salary based on the accumulation of coursework appears to be a poor use of district funds if raising student achievement is the desired outcome.

The Indiana Department of Education (IDOE) is currently in the process of changing requirements for teacher licensure. In the proposed Rules for Educator Preparation and Accountability (Indiana Department of Education, 2009), the IDOE is shifting the emphasis from pedagogical coursework to content area coursework. This

change is motivated in part by the same body of research reviewed in this study that reports the connection between content area preparation and student achievement. The initial proposal departed radically from the current emphasis on pedagogical coursework and was an example of the type of pendulum swing that can occur when attempts are made to adjust policy to correct a perceived problem. Consistent with the findings of this study, subsequent proposals acknowledged the value of pedagogy and content resulting in a more balanced emphasis.

Limitations

There are several cautions that should be addressed when considering the impact of this study. There are two measurement concerns relative to the assessment of teacher self-efficacy. The Teachers' Sense of Efficacy Scale (TSES) was vetted for assessing self-efficacy and found to be valid; however, the compressed range of responses limited the variability available for the analysis and may have affected the results. This compressed response range was also present in validation studies (Heneman, et al., 2006; Tschannen-Moran & Hoy, 2001). An instrument that produces a greater response range may be better suited for such a study. Assessing the teachers' self-efficacy in a more timely fashion may have provided different results also. I administered the TSES to teachers a year after they had the students. Perceptions of their own efficacy may well have changed in that 12 month period.

Teacher training is a value-added phenomenon. Assessing the value of training is difficult to do without knowledge of a baseline. What was not assessed or measured in this study was the apparent effectiveness of teachers prior to taking special education coursework or completing the requirements for licensure. If the effectiveness of each of

the participants could have been assessed as they accumulated course credits, a different story may have emerged.

Unfortunately one of the variables this study intended to examine was not included. The predictive ability of teacher licensure exams on student achievement has received attention in the literature and was to be part of this study. The uneven availability of exam scores made it impossible to include the variable. Thus, a complete picture of teacher effects on student achievement was also unavailable.

Finally, the sample used in this study limits the ability to generalize the results to all settings. Although an attempt was made to sample a wide variety of teachers and students, the sample was overwhelmingly white and rural. The sample was also minimal for the statistical analyses used. Multi-leveling modeling produces more credible results with larger samples than the one used here (Tabachnick & Fidell, 2007).

Conclusions

Four research questions framed this study, all of which pertained to teacher characteristics and their effect on student achievement. In addition to answering these questions, it was suggested that the findings might allow for the creation of a profile of an effective teacher. It was further suggested that the importance of this study is its exploration of teacher effects on students with disabilities that had previously been reserved for general education students. This study has answered important questions that serve to inform education policy and practice in the areas of teacher training and student assessment.

Teacher training programs are beneficial and should not be abandoned as a way to prepare teachers for our schools; however, training programs should be parsimonious in

their credit hour requirements and rigorous in their demand on students. Focused, research-based pedagogy delivered with high expectations appears to be a promising approach to producing effective teachers.

The policy of including students with CD in high-stakes testing programs is potentially problematic and should be reconsidered. This study lends credence to the intuitive notion that students with intellectual deficits are ill served when held to the standards found in high-stakes testing programs. Educational accountability systems are requiring these students to compete on a potentially unrealistic platform. Even when provided with quality instruction, these students appear less successful on high-stakes measures than other special education students. Continually subjecting them to these tests, and judging schools and teachers on the results may be a nonproductive use of time.

This study is only a beginning look into the role of special education teacher characteristics and their effect on the achievement of students with disabilities. This study leaves many questions unanswered and serves to create new ones. The effects of teacher license exams on the achievement of general education students have been studied and were to be part of this study. Their inclusion in future studies on students with disabilities deserves consideration.

Mentoring has been a traditional aspect of teacher training. Credit hours garnered from field experience and student teaching were excluded from the count of course hours used in this study. Research into the role high quality field experience plays in promoting student achievement would help to inform this significant aspect of teacher training. A closer look at the coursework teachers take would also be informative. Teachers can take courses that are part of an engaging program of studies designed to provide professional

growth; they also have the option to accumulate college credits by taking random, disconnected courses that often demand little of them. It would be valuable to examine the degree of rigor of the courses teachers take and the resulting effect of that rigor.

Teacher self-efficacy is an important concept and deserves further attention. Studies using multiple student outcomes related directly to classroom instruction and high-stakes tests could bring into sharper focus the interplay between self-efficacy and student achievement.

A profile of an effective teacher did not materialize as this study had hoped. With the finding that college quality makes a difference in achievement, an interesting departure from the development of effective teacher profiles would be to examine school of education profiles to see what effect they have on student achievement. In such a study the structure or design of the teacher education program would be the profile of interest.

Finally, it should be emphasized that the role of student achievement in accountability programs at all levels is a complex issue. As stewards of our profession, educators need to resist the temptation to accept the overly simplified solutions proffered for these complex problems because of their political expedience. Rather, we must set about the hard work of improving our profession.

References

- Aguilar, A. (2007, November 7). Many schools fail only in special ed. *The Chicago Tribune*.
- Allbritten, D., Mainzer, R., & Ziegler, D. (2004). Will students with disabilities be scapegoats for school failures? *Educational Horizons*, 82, 153-160.
- Allinder, R. M. (1994). The relationship between efficacy and the instructional practices of special education teachers and consultants. *Teacher Education and Special Education*, 17(2), 86-95.
- Allinder, R. M. (1995). An examination of the relationship between teacher efficacy and curriculum-based measurement and student achievement. *Remedial and Special Education*, 16(4), 247-254.
- Aloe, A. M., & Becker, B. J. (2009). Teacher verbal ability and school outcomes: Where is the evidence? *Educational Researcher*, 38(8), 612-624.
- Alon, S., & Tienda, M. (2005). Assessing the "mismatch" hypothesis: Differences in college graduation rates by institutional selectivity. *Sociology of Education*, 78(4), 294.
- Anderson, N. (2006, February 25). Districts in Maryland miss special ed testing targets. *The Washington Post*. Retrieved from <http://www.lexisnexis.com/hottopics/lnacademic/>
- Anderson, N. (2010, January 12). Union president makes new proposals for teacher evaluations, discipline. *The Washington Post*. Retrieved from <http://pqasb.pqarchiver.com/washingtonpost/access/1937454771.html?FMT=ABS&FMTS=ABS:FT&date=Jan+12%2C+2010&author=Nick+Anderson&pub=The>

+Washington+Post&edition=&startpage=A.3&desc=Union+chief%27s+plan+ties
+test+scores%2C+teacher+evaluations

Anderson, R. N., Greene, M., & Loewen, P. (1988). Relationships among teachers' and students' thinking skills, sense of efficacy, and student achievement. *Alberta Journal of Educational Research*, 34(2), 148-165.

Armor, D., Conroy-Oseguera, P., Cox, M., King, N., McDonnell, L., Pascaal, A., ... Zellman, G. (1976). *Analysis of the school preferred reading program in selected Los Angeles minority schools*. Santa Monica, CA: Rand Corporation.

Baer, J., Baldi, S., Ayotte, K., & Green, P. J. (2007). *The reading literacy of U.S. fourth-grade students in an international context: Results from the 2001 and 2006 progress in international reading literacy study (PIRLS)* (NCES 2008-017).

Washington, DC: National Center for Education Statistics.

Baker, J. A. (2006). Contributions of teacher-child relationships to positive school adjustment during elementary school. *Journal of School Psychology*, 44(3), 211-229.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman.

Borg, W. R., & Gall, M. D. (1989). *Educational research: An introduction* (5th ed.). New York, NY: Longman.

Bowerman, B. L., & O'Connell, R. T. (1990). *Linear statistical models: An applied approach* (2nd ed.). Belmont, CA: Duxbury.

- Brewer, D. J., Eide, E. R., & Ehrenberg, R. G. (1999). Does it pay to attend an elite private college? Cross-cohort evidence on the effects of college type on earnings. *The Journal of Human Resources*, 34(1), 104-123.
- Brigharm, N., Morocco, C. C., Clay, K., & Zigmond, N. (2006). What makes a high school a good high school for students with disabilities. *Learning Disabilities Research & Practice*, v21(n3), 184-190.
- Brody, L. E., & Mills, C. J. (1997). Gifted children with learning disabilities: A review of the issues. *Journal of Learning Disabilities*, 30(3), 282-296.
- Browder, D., Ahlgrim-Dezell, L., Flowers, C., Karvonen, M., Spooner, F., & Algozzine, R. (2005). How states implement alternate assessments for students with disabilities. *Journal of Disability Policy Studies*, 15(4), 209-220.
- Brownell, M. T., & Pajares, F. M. (1996). The influence of teachers' efficacy beliefs on perceived success in mainstreaming students with learning and behavior problems: A path analysis. *Research Bulletin*, 27 (3).
- Buono, D. (Ed.). (2008). *Barron's 2009 profiles of American colleges* (28th ed.). Hauppauge, NY.
- Burke, M. A., & Sass, T. R. (2008). *Classroom peer effects and student achievement* (Working paper 08-5). Federal Reserve Bank of Boston.
- Campbell, J. R., Hombo, C. M., & Mazzeo, J. (2000). *NAEP 1999 trends in academic progress: Three decades of student performance* (No. 0-16-050558-5). Washington DC: National Center for Education Statistics.
- Carey, K. (2009). What american colleges can learn from the finns. *Chronicle of Higher Education*, 55(20), A33-A34.

- Carey, K. (2010). Why we need a 'race to the top' for higher education. *Chronicle of Higher Education*, 56(26), A30.
- Carlson, E., Lee, H., & Schroll-Westat, K. (2004). Identifying attributes of high quality special education teachers. *Teacher Education and Special Education*, 27(4), 350-359.
- Casey, M. B., Nuttall, R. L., & Pezaris, E. (2001). Spatial-mechanical reasoning skills versus mathematics self-confidence as mediators of gender differences on mathematics subtests using cross-national gender-based items. *Journal for Research in Mathematics Education*, 32(1), 28-57.
- Chatterji, M. (2006). Reading achievement gaps, correlates, and moderators of early reading achievement: Evidence from the early childhood longitudinal study (ECLS) kindergarten to first grade sample. *Journal of Educational Psychology*, 98(3), 489-507.
- Chen, G. (2007). School disorder and student achievement: A study of new york city elementary schools. *Journal of School Violence*, 6(1), 27-43.
- Chudowsky, N., & Chudowsky, V. (2009). *State test score trends through 2007-08, part 4: Has progress been made on raising achievement for students with disabilities?* Washington, DC: Center on Education Policy.
- Coladarci, T., & Breton, W. A. (1991, April). *Teacher efficacy, supervision, and the special education resource-room teacher*. Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, IL.

- Coleman, J. S. (1966). *Equality of educational opportunity (Coleman) study (EEOS)*. Washington, DC: Department of Health, Education, and Welfare, Office of Education/National Center for Education Statistics
- Cook, B. G., & Tankersley, M. (2000). Teachers' attitudes toward their included students with disabilities. *Exceptional Children*, 67(1), 115-135.
- Croninger, R. G., Rice, J. K., Rathbun, A., & Nishio, M. (2007). Teacher qualifications and early learning: Effects of certification, degree, and experience on first-grade student achievement. *Economics of Education Review*, 26(3), 312-324.
- Cruickshank, W. M., Bentzen, F. A., Ratzeburg, F. H., & Tannhauser, M. T. (1961). *A teaching method for brain-injured and hyperactive children; a demonstration-pilot study*. Syracuse, NY: Syracuse University Press.
- Dahl, G., & Lochner, L. (2005). *The impact of family income on child achievement* (Discussion paper no. 1305-05). University of Wisconsin Institute for Research on Poverty.
- Dale, S. B., & Krueger, A. B. (2002). Estimating the payoff to attending a more selective college: An application of selection on observables and unobservables. *The Quarterly Journal of Economics*, 117(4), 1491-1527.
- Darling-Hammond, L. (1990). Teaching and knowledge: Policy issues posed by alternative certification for teachers. *Peabody Journal of Education*, 67(3), 123-154.
- Darling-Hammond, L. (2000). Teacher quality and student achievement: A review of state policy evidence. *Education Policy Analysis Archives*. Retrieved from <http://epaa.asu.edu/epaa>

- Darling-Hammond, L. (2006). Constructing 21st-century teacher education. *Journal of Teacher Education*, 57(3), 300-314.
- Darling-Hammond, L., Berry, B., & Thoreson, A. (2001). Does teacher certification matter? Evaluating the evidence. *Educational Evaluation and Policy Analysis*, 23, 57-78.
- Darling-Hammond, L., Holtzman, D. J., Gatlin, S. J., & Heilig, J. V. (2005). Does teacher preparation matter? Evidence about teacher certification, teach for America, and teacher effectiveness. *Education Policy Analysis Archives*, 13(42).
- De Vise, D. (2005, November 17). Seven schools miss 'no child' targets; special ed scores cited as factor. *The Washington Post*.
- Druva, C. A., & Anderson, R. D. (1983). Science teacher characteristics by teacher behavior and by student outcome: A meta-analysis of research. *Journal of Research in Science Teaching*, 20(5), 467-479.
- Editorial: "Unbridled costs;" as special education spending soars, DC schools raid other accounts. [Editorial]. (2006, June 6). *The Washington Post*.
- Educational Testing Service (2010). *The praxis series*. Retrieved from <http://www.ets.org/portal/site/ets/menuitem.fab2360b1645a1de9b3a0779f1751509/?vgnextoid=48c05ee3d74f4010VgnVCM10000022f95190RCRD&WT.ac=Praxis+Brochure+and+Front+Door>
- Ehrenberg, R. G., & Brewer, D. J. (1994). Do school and teacher characteristics matter? Evidence from "High school and beyond.". *Economics of Education Review*, 13(1), 1-17.

- Ehrenberg, R. G., & Brewer, D. J. (1995). Did teachers' verbal ability and race matter in the 1960s? Coleman revisited. *Economics of Education Review*, 14(1), 1-21.
- Einhorn, E. (2007, December 12). Hired guns told schools to slash special ed. *Daily News*.
- Elmore, R. F., Abelman, C. H., & Fuhrman, S. H. (1996). The new accountability in state education reform: From process to performance. In H. F. Ladd (Ed.), *Holding schools accountable* (pp. 65-98). Washington, DC: The Brookings Institute.
- Ferguson, R. F. (1998). Can schools narrow the black-white test score gap? In C. Jencks & M. Phillips (Eds.), *The black-white test score gap* (pp. 318-374). Washington, DC: Brookings Institution.
- Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). Los Angeles, CA: Sage.
- Fitzmaurice, G. M., Laird, N. M., & Ware, J. H. (2004). *Applied longitudinal analysis*. Hoboken, NY: Wiley-Interscience.
- Fox, M. (1993). Is it a good investment to attend an elite private college? *Economics of Education Review*, 12(2), 137-151.
- Freeman, C. E. (2004). *Trends in educational equity of girls & women: 2004* (No. NCES 2005-016). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.
- Gallagher, A. M., Lisi, R. D., Holst, P. C., Lisi, A. V. M.-D., Morely, M., & Cahalan, C. (2000). Gender differences in advanced mathematical problem solving. *Journal of Experimental Child Psychology*, 75, 165-190.
- Garson, G. D. (2009). *Linear mixed models, from statnotes: Topics in multivariate analysis*. Retrieved from <http://faculty.chass.ncsu.edu/garson/PA765/statnote.htm>

- Gershoff, E. (2003). *Low income and the development of America's kindergartners* (Living at the Edge research brief no. 3). New York, NY: Columbia University National Center for Children in Poverty
- Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology*, 76(4), 569-582.
- Goldhaber, D. (2007, March). *Everyone's doing it, but what does teacher testing tell us about teacher effectiveness?* Paper presented at the American Educational Research Association, Chicago, IL.
- Goldhaber, D., & Anthony, E. (2004). *Can teacher quality be effectively assessed?* Unpublished manuscript, University of Washington Urban Institute, Seattle, WA.
- Goldhaber, D., & Brewer, D. J. (1997a). Evaluating the effect of teacher degree level on student performance In W. J. Fowler (Ed.), *Developments in school finance, 1996* (pp. 197-210). Washington, DC: National Center for Educational Statistics, U.S. Dept of Education.
- Goldhaber, D., & Brewer, D. J. (1997b). Why don't schools and teachers seem to matter? Assessing the impact of unobservables on educational productivity. *The Journal of Human Resources*, 32(3), 505-523.
- Goldhaber, D., & Brewer, D. J. (1998). When should we reward degrees for teachers? *The Phi Delta Kappan*, 80(2), 134-138.
- Goldhaber, D., & Brewer, D. J. (2000). Does teacher certification matter? High school teacher certification status and student achievement. *Educational Evaluation and Policy Analysis*, 22(2), 129-145.

- Goldhaber, D., & Brewer, D. J. (2001). Evaluating the evidence on teacher certification: A rejoinder. *Educational Evaluation and Policy Analysis*, 23(1), 79-86.
- Gray, M. (2010, January 21). Special education students fail to meet federal benchmark. *Verona-Cedar Grove Times*.
- Greenwald, R., & Hedges, L. V. (1996). The effect of school resources on student achievement. *Review of Educational Research*, 66(3), 361-396.
- Guyton, E., Fox, M. C., & Sisk, K. A. (1991). Comparison of teaching attitudes, teacher efficacy, and teacher performance of first year teachers prepared by alternative and traditional teacher education programs. *Action in Teacher Education*, 13(2), 1-9.
- Hallahan, D. P., & Mercer, C. D. (2001, August). *Learning disabilities: Historical perspectives. Executive summary*. Paper presented at the Learning Disabilities Summit: Building a Foundation for the Future, Washington, DC.
- Hallahan, D. P., & Mock, D. R. (2003). A brief history of the field of learning disabilities. In H. L. Swanson, K. R. Harris & S. Graham (Eds.), *Handbook of learning disabilities* (pp. 16-29). New York: Guilford Press.
- Hanushek, E. A. (1986). The economics of schooling: Production and efficiency in public schools. *Journal of Economic Literature*, 24(3), 1141-1177.
- Hanushek, E. A. (1992). The trade-off between child quantity and quality. *The Journal of Political Economy*, 100(1), 84-117.
- Harvey, L., & Green, D. (1993). Defining quality. *Assessment and Evaluation in Higher Education*, 18(1), 9-34.

- Hawk, P. P., Coble, C. R., & Swanson, M. (1985). Certification: It does matter. *Journal of Teacher Education*, 36(3), 13-15.
- Hawk, P. P., & Schmidt, M. W. (1989). Teacher preparation: A comparison of traditional and alternative programs. *Journal of Teacher Education*, 40(5), 53-58.
- Heneman, H. G., III, Kimball, S., & Milanowski, A. (2006). *The teacher sense of efficacy scale: Validation evidence and behavioral prediction* (WCER working paper no. 2006-7). Madison, WI: Wisconsin Center for Education Research, University of Wisconsin.
- Hess, F. M. (2002). Tear down this wall: The case for a radical overhaul of teacher certification. *Educational Horizons*, 80(4), 169-183.
- Hess, F. M., Schneider, M., Carey, K., & Kelly, A. P. (2009). *Diplomas and dropouts: Which colleges actually graduate their students (and which don't)*. Washington, DC: The American Enterprise Institute.
- Hightower, A. M. (2010). State of the states: Holding all states to high standards. *Education Week*, 29(17). Retrieved from <http://www.edweek.org/ew/articles/2010/01/14/17stateofstates.h29.html>
- Hipp, K. K., Stoll, L., Bolam, R., Wallace, M., McMahon, A., Thomas, S., Huffman, J. B. (2003, April). *An international perspective on the development of learning communities*. Paper presented at the American Educational Research Association, Chicago, IL.
- Hox, J. J. (1995). *Applied multilevel analysis*. Amsterdam: TT-Publikaties.
- Hox, J. J. (2002). *Multilevel analysis : Techniques and applications*. Mahwah, N.J.: Lawrence Erlbaum Associates.

- Huang, F. L., & Moon, T. R. (2009). Is experience the best teacher? A multilevel analysis of teacher characteristics and student achievement in low performing schools. *Educational Assessment, Evaluation and Accountability*, 21(3), 209-234.
- Indiana Department of Education (2009). Proposed rule revisions for educator preparation and accountability Retrieved from <http://www.doe.in.gov/news/2009/07-July/REPA.html>
- Individuals with disabilities education improvement act, 20 U.S.C. § 1415. (2004).
- Johnson, D. R., Thurlow, M. L., & Stout, K. E. (2007). *Revisiting graduation requirements and diploma options for youth with disabilities: A national study* (Technical report 49). University of Minnesota: National Center on Educational Outcomes.
- Jordan, J. (2007). Fears over changes in special education. *The Rhode Island News*. Retrieved from http://www.projo.com/news/content/special_education_reg_21_03-21-07_TQ4UGAK.3720c27.html
- Klecker, B. M. (2006). The gender gap in NAEP fourth-, eighth-, and twelfth-grade reading scores across years. *Reading Improvement*, 43(1), 50-56.
- Kosena, J. (2007). PSD in balancing act: Funding for special needs not constant. *The Coloradoan*. Retrieved from <http://www.coloradoan.com/apps/pbcs.dll/article?AID=/20070522/NEWS01/705220326/1002>
- Kreft, I. G. G., & De Leeuw, J. (1998). *Introducing multilevel modeling*. London; Thousand Oaks, CA: Sage.

- Lachance, J. A., & Mazzocco, M. M. (2006). A longitudinal analysis of sex differences in math and spatial skills in primary school age children. *Learning & Individual Differences, 16*(3), 195-216.
- Ladd, G. W., & Dinella, L. M. (2009). Continuity and change in early school engagement: Predictive of children's achievement trajectories from first to eighth grade? *Journal of Educational Psychology, 101*(1), 190-206.
- Lee, J. (2002). Racial and ethnic achievement gap trends: Reversing the progress toward equity? *Educational Researcher, 31*(1), 3-12.
- Linn, R. L., Baker, E. L., & Betebenner, D. W. (2002). Accountability systems: Implications of requirements of the no child left behind act of 2001. *Educational Researcher, 31*(6), 3-16.
- Little, R., & Rubin, D. B. (2002). *Statistical analysis with missing data* (2nd ed.). Hoboken, NJ: Wiley.
- Lubienski, S. T., & Shelley, M. C., II (2003, April). *A closer look at U.S. mathematics instruction and achievement: Examinations of race and SES in a decade of NAEP data*. Paper presented at the American Educational Research Association, Chicago, IL.
- Lutz, F. W., & Hutton, J. B. (1989). Alternative teacher certification: Its policy implications for classroom and personnel practice. *Educational Evaluation and Policy Analysis, 11*(3), 237-254.
- Marshall, S. P., & Smith, J. D. (1987). Sex differences in learning mathematics: A longitudinal study with item and error analyses. *Journal of Educational Psychology, 79*(4), 372-383.

- Matus, R., & Waite, M. (2004, June 6). Standards collide; schools graded a success by state, a flop by feds. *St. Petersburg Times*.
- Mau, W.-C., & Lynn, R. (2000). Gender differences in homework and test scores in mathematics, reading and science at tenth and twelfth grade. *Psychology, Evolution & Gender*, 2(2), 119-125.
- McCaffrey, D. F., Lockwood, J. R., Koretz, D., Louis, T. A., & Hamilton, L. (2004). Models for value-added modeling of teacher effects. *Journal of Educational and Behavioral Statistics*, 29(1), 67-102.
- McCracken, S. (1972). Review: [untitled]. *Change*, 4(5), 53-57.
- McDiarmid, G. W., & Wilson, S. M. (1991). An exploration of the subject matter knowledge of alternative route teachers: Can we assume they know their subject? *Journal of Teacher Education*, 42(2), 93-103.
- Melguizo, T. (2008). Quality matters: Assessing the impact of attending more selective institutions on college completion rates of minorities. *Research in Higher Education*, 49(3), 214-236.
- Menard, S. (1995). Applied logistic regression analysis. *Sage university paper series on quantitative applications in the social sciences* (No. 07-106). Thousand Oaks, CA: Sage.
- Mertens, D. (2005). *Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods* (2nd ed.). Thousand Oaks, CA: Sage Publications.

- Mikulecky, M., Shkodriani, G., & Wilner, A. (2004). *A growing trend to address the teacher shortage. Alternative certification. Policy brief*. Denver, CO: Education Commission of the States.
- Miller, J. W., McKenna, B. A., & McKenna, M. C. (1998). A comparison of alternatively and traditionally prepared teachers. *Journal of Teacher Education*, 49(3), 165-176.
- Monk, D. H., & King, J. (1994). Multilevel teacher resource effects on pupil performance in secondary mathematics and science: The case of teacher subject-matter preparation. In R. G. Ehrenberg (Ed.), *Contemporary policy issues: Choices and consequences in education* (pp. 29-58). Ithaca, NY: ILR.
- Murray, C., & Pianta, R. C. (2007). The importance of teacher-student relationships for adolescents with high incidence disabilities. *Theory Into Practice*, 46(2), 105-112.
- Myers, R. (1990). *Classical and modern regression with applications* (2nd ed.). Boston, MA: Duxbury.
- National Center for Education Statistics (2004). *Digest of education statistics: Chapter 2. Elementary and secondary education, table 54*. Retrieved from http://nces.ed.gov/programs/digest/d04/tables/dt04_054.asp
- National Center for Education Statistics (2005). *Schools and staffing survey, table 2*. Retrieved from [nces.ed.gov/programs/coe/2005/analysis/tableXLS.asp?tableID=316 - 8k](http://nces.ed.gov/programs/coe/2005/analysis/tableXLS.asp?tableID=316-8k)
- National Center for Education Statistics (2007). *Digest of education statistics: Chapter 2. Elementary and secondary education, table 47*. Retrieved from http://nces.ed.gov/programs/digest/d07/tables/dt07_047.asp

- National Commission on Excellence in Education (1983). *A nation at risk: The imperative for educational reform*. Washington, DC: U.S. Government Printing Office. .
- Nye, B., Konstantopoulos, S., & Hedges, L. V. (2004). How large are teacher effects? *Educational Evaluation and Policy Analysis*, 26(3), 237-257.
- Ohio Department of Education (2008). *Teacher Preparation and Licensure Information*. Retrieved from <http://www.ode.state.oh.us/GD/Templates/Pages/ODE/ODEDetail.aspx?page=3&TopicRelationID=942&ContentID=9670&Content=36846>
- Palardy, G. J., & Rumberger, R. W. (2008). Teacher effectiveness in first grade: The importance of background qualifications, attitudes, and instructional practices for student learning. *Educational Evaluation and Policy Analysis*, 30(2), 111-140.
- Quirk, T. J., Witten, B. J., & Weinberg, S. F. (1973). Review of studies of the concurrent and predictive validity of the national teacher examinations. *Review of Educational Research*, 43(1), 89-113.
- Rachor, R. E., & Cizek, G. J. (1996, April). *Reliability of raw gain, residual gain, and estimated true gain scores: A simulation study*. Paper presented at the American Educational Research Association, New York, NY.
- Raudenbush, S. W. (2004). What are value-added models estimating and what does this imply for statistical practice? *Journal of Educational and Behavioral Statistics*, 29(1), 121-130.
- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models : Applications and data analysis methods* (2nd ed.). Thousand Oaks: Sage Publications.

- Ready, D. D., Logerfo, L. F., Burkam, D. T., & Lee, V. E. (2005). Explaining girls' advantage in kindergarten literacy learning: Do classroom behaviors make a difference? *Elementary School Journal*, 106(1), 21-38.
- Rethinam, V., Pyke, C., & Lynch, S. (2008). Using multi-level analyses to study the effectiveness of science curriculum materials. *Evaluation & Research in Education*, 21(1), 18-42.
- Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica*, 73(2), 418-458.
- Robelen, E. W. (2009). Race to the top driving policy action across states. *Education Week*, 29(16). Retrieved from http://www.edweek.org/ew/articles/2009/12/23/16_states.h29.html?tkn=XWTF158Gg5g%2BnzELZHI79UdBGLFNQe%2BOW5xT
- Rock, D. R. (2007). *A note on gain scores and their interpretation in developmental models designed to measure change in the early school years* (Report No. RR-07-08). Princeton, NJ: ETS. Retrieved from <http://www.ets.org/Media/Research/pdf/RR-07-08.pdf>
- Rockoff, J. E. (2003). *The impact of individual teachers on student achievement: Evidence from panel data*. Cambridge, MA: Harvard University, Kennedy School of Government.
- Rockoff, J. E., Jacob, B. A., Kane, T. J., & Staiger, D. O. (2008). *Can you recognize an effective teacher when you recruit one?* (NBER working paper no. 14485). National Bureau of Economic Research: Cambridge, MA. Retrieved from <http://www.nber.org/papers/w14485>

- Ross, J. A. (1992). Teacher efficacy and the effects of coaching on student achievement. *Canadian Journal of Education / Revue Canadienne de l'education*, 17(1), 51-65.
- Rossi, P. H., Lipsey, M. W., & Freeman, H. E. (2004). *Evaluation: A systematic approach* (7th ed.). Thousand Oaks, CA: Sage.
- Rouse, M., & Florian, L. (1996). Effective inclusive schools: A study in two countries. *Cambridge Journal of Education*, 26(1), 71-85.
- Rowan, B., Chiang, F.-S., & Miller, R. J. (1997). Using research on employees' performance to study the effects of teachers on students' achievement. *Sociology of Education*, 70(4), 256-284.
- Rowan, B., Correnti, R., & Miller, R. J. (2002). What large-scale, survey research tells us about teacher effects on student achievement: Insights from the "prospects" study of elementary schools. *Teachers College Record*, 104(8), 1525-1567.
- Rubin, D. B., Stuart, E. A., & Zanutto, E. L. (2004). A potential outcomes view of value-added assessment in education. *Journal of Educational and Behavioral Statistics*, 29(1), 103-116.
- Sanders, W. L. (1998). Value-added assessment. *School Administrator*, 55(11), 24-27.
- Sanders, W. L. (2006, October). *Comparisons among various educational assessment value-added models*. Paper presented at the The Power of Two National Value-Added Conference, Columbus, OH.
- Sanders, W. L., & Rivers, J. C. (1996). *Cumulative and residual effects of teachers on future academic achievement*. Knoxville, TN: University of Tennessee Value-Added Research and Assessment Center.

- Schreiber, J. B., & Griffin, B. W. (2004). Review of multilevel modeling and multilevel studies in the journal of educational research (1992-2002). *Journal of Educational Research*, 98(1), 24-33.
- Sisk, C. (2010, January 14). Tn teachers, Bredesen reach deal. *The Tennessean*.
- Snijders, T. A. B., & Bosker, R. J. (1999). *Multilevel analysis*. Thousand Oaks: Sage.
- Snipes, J., Williams, A., Horwitz, A., Soga, K., & Casserly, M. (2007). *Beating the odds: An analysis of student performance and achievement gaps on state assessments. Results from the 2005-2006 school year*. Washington, DC: Council of the Great City Schools.
- Stafford, D., & Barrow, G. (1994). Houston's alternative certification program. *Educational Forum*, 58(2), 193-200.
- Stoll, L. (1991). School effectiveness in action: Supporting growth in schools and classrooms. In M. Ainscow (Ed.), *Effective schools for all*. London: David Fulton.
- Stoll, L. (1999). Realising our potential: Understanding and developing capacity for lasting improvement. *School Effectiveness and School Improvement*, 10(4), 503-532.
- Stullich, S., Eisner, E., & McRary, J. (2007). *National assessment of title I: Final report, volume I: Implementation*. Washington, DC: U.S. Department of Education, Policy and Program Studies Service.
- Summers, A. A., & Wolfe, B. L. (1975). *Equality of educational opportunity quantified : A production function approach*. Philadelphia: Federal Reserve Bank
- Summers, A. A., & Wolfe, B. L. (1977). Do schools make a difference? *The American Economic Review*, 67(4), 639-652.

- Swaminathan, R. (2004). "Its my place": Student perspectives on urban school effectiveness. *School Effectiveness and School Improvement*, 15(1), 33-63. doi: 10.1076/sesi.15.1.33.27493
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5 ed.). Boston, MA: Pearson Education.
- Talbott, E., & Fleming, J. (2003). The role of social contexts and special education in the mental health problems of urban adolescents. *Journal of Special Education*, 37(2), 111-123.
- Tate, W. (1997). Race-ethnicity, SES, gender and language. *Journal for Research in Mathematics Education*, 28(6), 652-679.
- Tekwe, C. D., Carter, R. L., Ma, C.-X., Algina, J., Lucas, M. E., Roth, J., ... Resnick, M. B. (2004). An empirical comparison of statistical models for value-added assessment of school performance. *Journal of Educational and Behavioral Statistics*, 29(1), 11-36.
- Terwilliger, J. S., & Magnuson, P. (2005). Limited english proficiency, race/ethnicity and socio-economic status as influences on scores in large-scale assessments. *Online Submission*. Retrieved from <http://bert.lib.indiana.edu:2048/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=ED490476&site=ehost-live>
- Thomas, S. L. (2003). Longer-term economic effects of college selectivity and control. *Research in Higher Education*, 44(3), 263-299.
- Thurlow, M. L., & Johnson, D. R. (2000). High-stakes testing of students with disabilities. *Journal of Teacher Education*, 51(4), 305-314.

- Tschannen-Moran, M., & Barr, M. (2004). Fostering student learning: The relationship of collective teacher efficacy and student achievement. *Leadership & Policy in Schools*, 3(3), 189-209.
- Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education*, 17(7), 783-805.
- U.S. Department of Education (2005). *Spellings announces new special education guidelines, details workable, "common sense" policy to help states implement no child left behind*. Retrieved from <http://www.ed.gov/news/pressreleases/2005/05/05102005.html>.
- U.S. Department of Education (2006a). *The secretary's fifth annual report on teacher quality*. Retrieved from <http://www.ed.gov/about/reports/annual/teachprep/2006-title2report.pdf>
- U.S. Department of Education (2006b). *Twenty-eighth annual report to congress on the implementation of the individuals with disabilities education act*. Retrieved from <http://www2.ed.gov/about/reports/annual/osep/2006/parts-b-c/index.html>
- U.S. Department of Education (2007). *National assessment of title I. Final report. Summary of key findings* (NCEE 2008-4014). Washington, DC: U.S. Department of Education, Institute of Education Sciences.
- Vanderhaar, J. E., Munoz, M. A., & Rodosky, R. J. (2006). Leadership as accountability for learning: The effects of school poverty, teacher experience, previous achievement, and principal preparation programs on student achievement. *Journal of Personnel Evaluation in Education*, 19, 17-33.

- Viadero, D. (2006). Concern over gender gaps shifting to boys. *Education Week*, 25(27), 1,16-17.
- Wayne, A. J., & Youngs, P. (2003). Teacher characteristics and student achievement gains. *Review of Educational Research*, 73(1), 89-122.
- Wheldall, K. (1994). *Why do contemporary special educators favour a noncategorical approach to teaching?* Retrieved from http://www.musec.mq.edu.au/downloads/Contemporary_Special_Educators.pdf
- Why is your school on this list? (2006, March 3). *The Washington Post*.
- Wiens, K. (2005). The new gender gap: What went wrong? *Journal of Education*, 186(3), 11-27.
- Wigle, S. E., & Wilcox, D. J. (1998, October). *The special education competencies of special educators*. Paper presented at the Annual Conference of the Mid-West Educational Research Association Chicago, Illinois.
- Williams, R. H., & Zimmerman, D. W. (1996). Are simple gain scores obsolete? *Applied Psychological Measurement*, 20(1), 59-69.
- Wright, S. P. (2004, July). *Advantages of a multivariate longitudinal approach to educational value-added assessment without imputation*. Paper presented at the National Evaluation Institute, Colorado Springs, CO.

Appendix A

Teachers' Sense of Efficacy Scale¹ (long form)

Teacher Beliefs	How much can you do?									
Directions: This questionnaire is designed to help us gain a better understanding of the kinds of things that create difficulties for teachers in their school activities. Please indicate your opinion about each of the statements below. Your answers are confidential.	Nothing	Very Little	Some Influence	Quite A Bit	A Great Deal					
1. How much can you do to get through to the most difficult students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
2. How much can you do to help your students think critically?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
3. How much can you do to control disruptive behavior in the classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
4. How much can you do to motivate students who show low interest in school work?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
5. To what extent can you make your expectations clear about student behavior?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
6. How much can you do to get students to believe they can do well in school work?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
7. How well can you respond to difficult questions from your students ?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
8. How well can you establish routines to keep activities running smoothly?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
9. How much can you do to help your students value learning?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
10. How much can you gauge student comprehension of what you have taught?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
11. To what extent can you craft good questions for your students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
12. How much can you do to foster student creativity?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
13. How much can you do to get children to follow classroom rules?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
14. How much can you do to improve the understanding of a student who is failing?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
15. How much can you do to calm a student who is disruptive or noisy?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
16. How well can you establish a classroom management system with each group of students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
17. How much can you do to adjust your lessons to the proper level for individual students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
18. How much can you use a variety of assessment strategies?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
19. How well can you keep a few problem students from ruining an entire lesson?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
20. To what extent can you provide an alternative explanation or example when students are confused?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
21. How well can you respond to defiant students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
22. How much can you assist families in helping their children do well in school?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
23. How well can you implement alternative strategies in your classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
24. How well can you provide appropriate challenges for very capable students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	

Appendix B

INDIANA UNIVERSITY – BLOOMINGTON (Study #08-13083) INFORMED CONSENT STATEMENT-Teacher Characteristics and the Achievement of Students with Disabilities

You are invited to participate in a research study. The purpose of this research is to examine the effects of various teacher factors on the performance of students with disabilities on high stakes tests, namely the Ohio Achievement Test (OAT). The results of this research will be used to guide schools of education as they develop teacher training programs and local schools as they recruit and select teachers for students with disabilities.

INFORMATION

This is a study of the relationship between several factors related primarily to your teacher preparation experience and your students' performance on the OAT. Specifically, data will be collected on the college you attended, the amount of special education coursework you have taken, your Praxis scores, the type of teaching license you have, and your self-rated degree of teaching self-efficacy.

In order to collect the self-efficacy data, you will be asked to fill out a short survey that takes approximately 10 minutes to complete. The remainder of the data will be collected from your personnel file. The survey is available on line and can be accessed at any time. A paper version is also available if you prefer. Student data will be collected from the district EMIS coordinator.

RISKS

There are no foreseeable risks or discomforts to you as a participant in this study.

BENEFITS

The findings of this study will inform the practice of teacher preparation as well as the teacher selection process of local school districts. Professional development in the form of inservice on the results of the study will be made available to all participating schools.

CONFIDENTIALITY

Your participation in this research study will be completely confidential. When you submit your data it will have your name attached. After all the teacher data has been collected, It will be matched to the students' data. After matching the records, all names will be removed from the data file. No names, including names of schools and school districts, will be used in the reporting of this data.

CONTACT

If you have questions at any time about the study or the procedures, you may contact Ben Edmonds at (937) 541-1981 (bcedmond@indiana.edu), 20 Eagles Way, Piqua, OH 45356.

Initials

If you feel you have not been treated according to the descriptions in this form, or your rights as a participant has not been honored during the course of this project, you may contact the office for the Indiana University Bloomington Human Subjects Committee, Carmichael Center L03, 530 E. Kirkwood Ave., Bloomington, IN 47408, 812/855-3067, by e-mail at iub_hsc@indiana.edu.

PARTICIPATION

Your participation in this study is voluntary; you may refuse to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed your data will be returned to you or destroyed.

CONSENT

I have read this form and received a copy of it. I have had all my questions answered to my satisfaction. I agree to take part in this study.

Subject's name (print): _____

Subject's signature: _____ Date: _____

Thank you for your consideration.

Ben Edmonds
Ph.D. Candidate in Special Education
Indiana University

Consent form date: April 8, 2008

IRB Approved Approval Date: April 23, 2008 Expires: June 1, 2009
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Appendix C

Teacher Characteristics and the Achievement of Students with Disabilities A Dissertation Study by Ben Edmonds 2007-2008

DATA COLLECTION STEPS:

- 1) Teacher data (by end of school year)
 - a. Secure list of all special education teachers who taught grades 4-8 during 2006-07 currently in district including email addresses (DOSE)
 - b. Contact sped teachers
 - i. How?
 - ii. When?
 1. Complete survey "Teachers Sense of Efficacy Scale" (5-10 min)
 2. Provide info on Praxis scores, college attended, years of experience, and type of license.
 3. Secure agreement to participate
 - c. Review teacher files for coursework data
- 2) Student data
 - a. Gain access to 2006-07 value-added data in EVAAS data base (Supt/EMIS)
 - i. Run custom report
 1. NCEs from 2006 & 2007
 2. Gender
 3. Race
 4. Grade
 5. Econ Disadvantage
 - ii. Download report into Excel file (No student names, SID only)
 - b. Run Where Kids Count report for 2006-07 and download into Excel (EMIS)
 - i. Make a copy of the file for EMIS with names and a copy for Ben w/o names
 - ii. Compare WKC report with data collected from EVAAS file. Discard EVAAS data for students not counted in district's report card.
 - iii. Use WKC report to record student disability type.
 - iv. Merge Excel files into one database of usable student data records (No student names)
 - v. Merged file is returned to EMIS to add names of students
- 3) Linking teacher and student data
 - a. Ben will give DOSE Excel file of teacher data and list of random ID codes
 - i. DOSE will assign an ID code to each teacher record
 - b. EMIS provides DOSE Excel file of eligible student data records w/names
 - i. DOSE will add teacher ID codes to corresponding student records for the 2006-07 school year
 - ii. Student data for teachers no longer in the district will be assigned to EDMONDS
 - c. DOSE will make a copy of each file
 - i. Archive copies with teacher and student names will be kept in district.
 - ii. Working copies of files will have names removed and be returned to Ben

Appendix D

Supportive Data for Assumptions of Normality

Table D1

*Descriptive Statistics of the Outcome Variable
(Reading Gain)*

Parameter	Statistic	SE
Mean	-.041	.717
Variance	237.510	
Std. Deviation	15.411	
Minimum	-56.000	
Maximum	56.000	
Skewness	-.198	.114
Kurtosis	.795	.227

Table D2

Correlations Between Teacher Variables Affecting Student Achievement

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Reading Gain	--	-.152*	-.013	-.016	.062	-.013	.065	.028	-.009	-.045	-.050
2. Coursework		--	-.163*	-.074	-.437*	.074	-.269*	.065	.057	-.048	.153*
3. TSES			--	-.164*	.148*	.026	-.235*	.152*	-.085*	.019	-.002
4. Experience				--	-.234*	-.026	.440*	.246*	.145*	.452*	.126*
5. License Type					--	-.095*	.199*	-.117*	-.137*	-.225*	-.218*
6. Noncompetitive						--	-.128*	-.073	-.086*	.011	.282*
7. Very competitive							--	-.157*	-.185*	.244*	-.109*
8. VCP and HC								--	.071	.174*	.055
9. CD									--	-.203*	-.197*
10. LD										--	-.322*
11. CDLD											--

* $p < .05$

Appendix D, continued

Table D3

Collinearity Statistics of Fixed Effects in the Full Model

Variable	Tolerance	VIF
Coursework	.732	1.365
TSES	.831	1.204
Experience	.397	2.521
College Selectivity		
Noncompetitive	.867	1.153
Very competitive	.532	1.880
VCP and HC	.809	1.236
License Type	.595	1.679
License Area		
CD	.600	1.665
LD	.419	2.384
CD & LD	.493	2.030
Average		1.712

Appendix D, continued

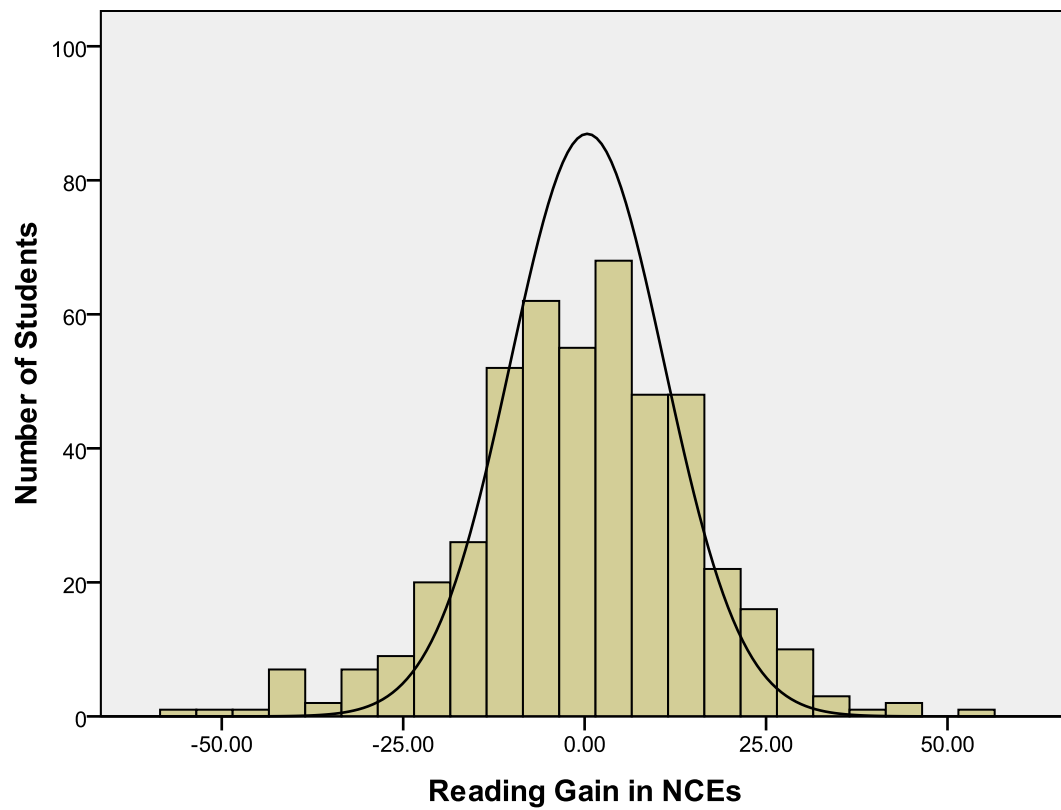


Figure D1. Distribution of reading gain from 2006-2007 expressed in NCEs. $N = 462$, $M = -0.04(15.41)$

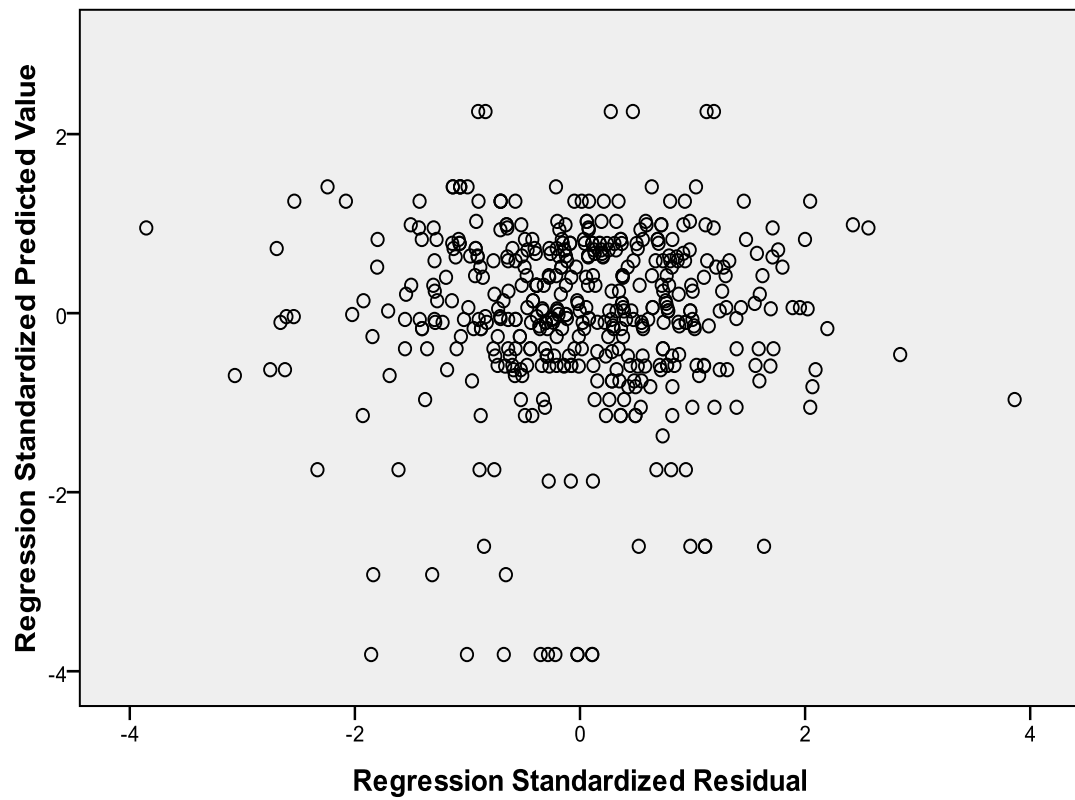


Figure D2. Scatterplot of predicted values of reading gain.

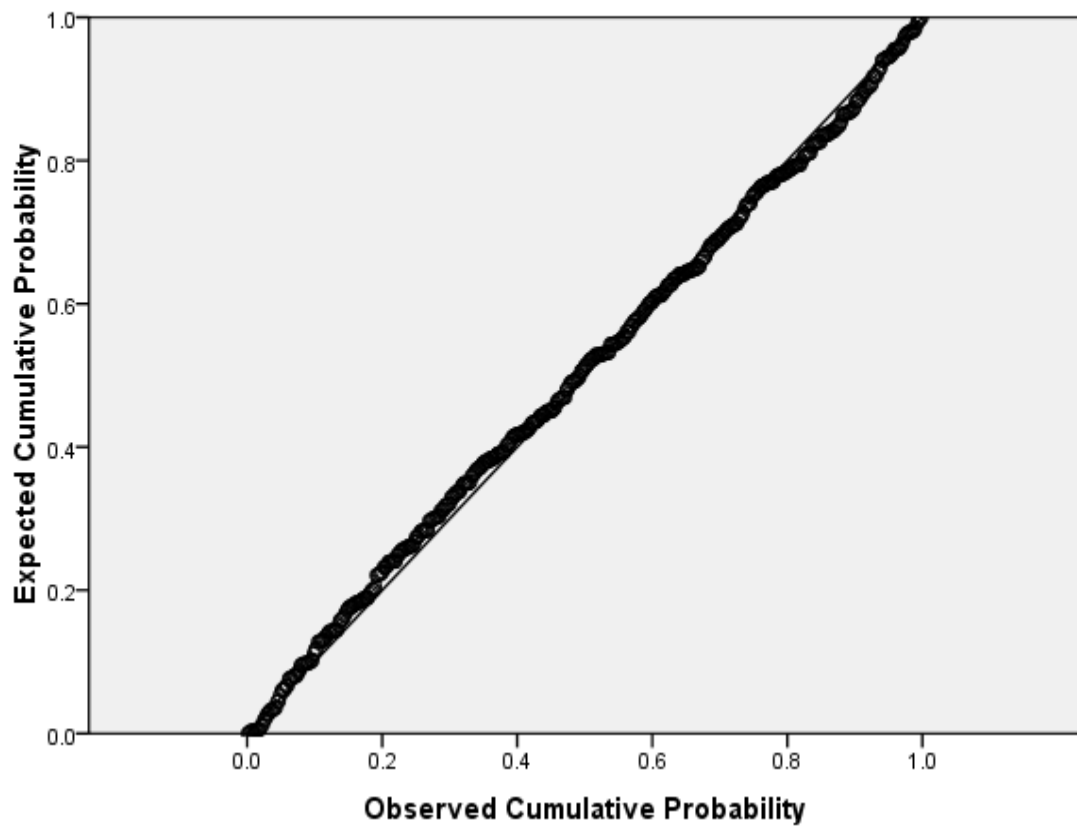


Figure D3. Probability plot of observed reading gain scores against a normal distribution.

Appendix D, continued

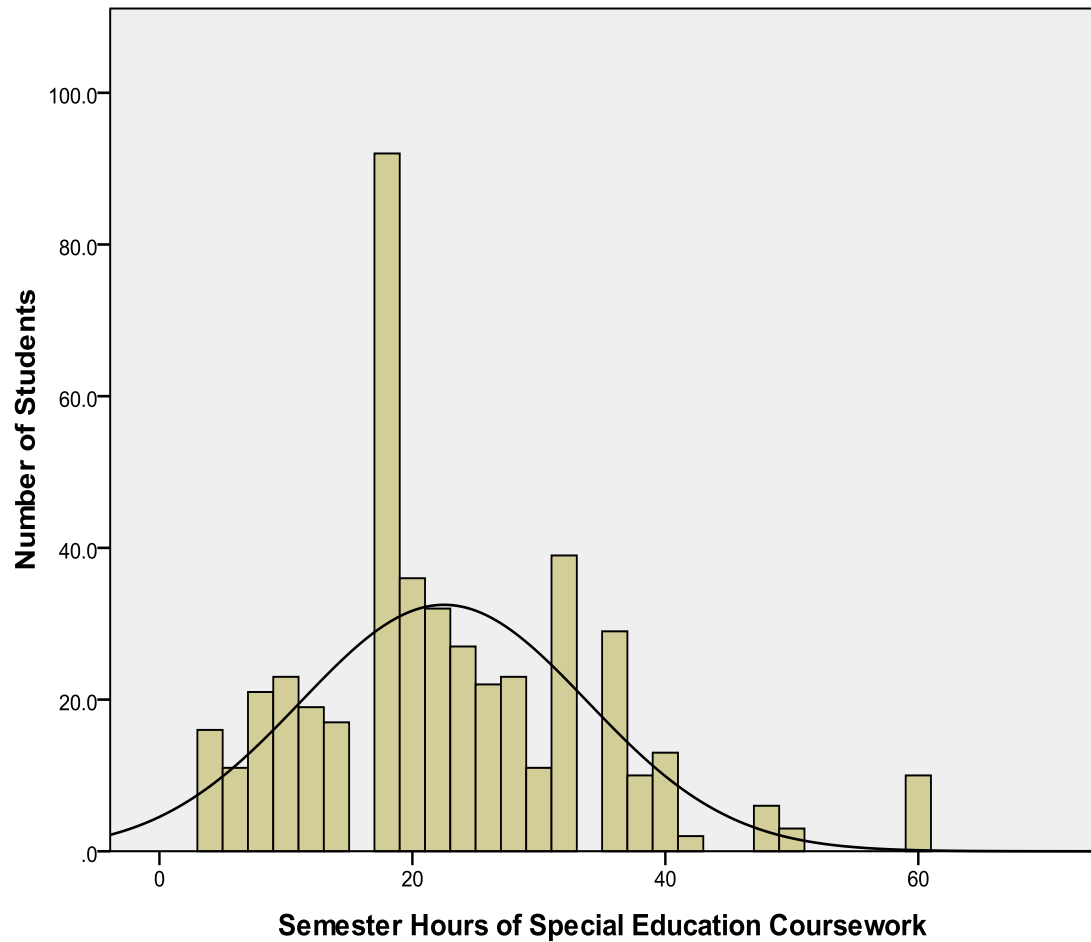


Figure D4. Distribution of hours of coursework over students. $N = 462$, $M = 22.51(11.33)$

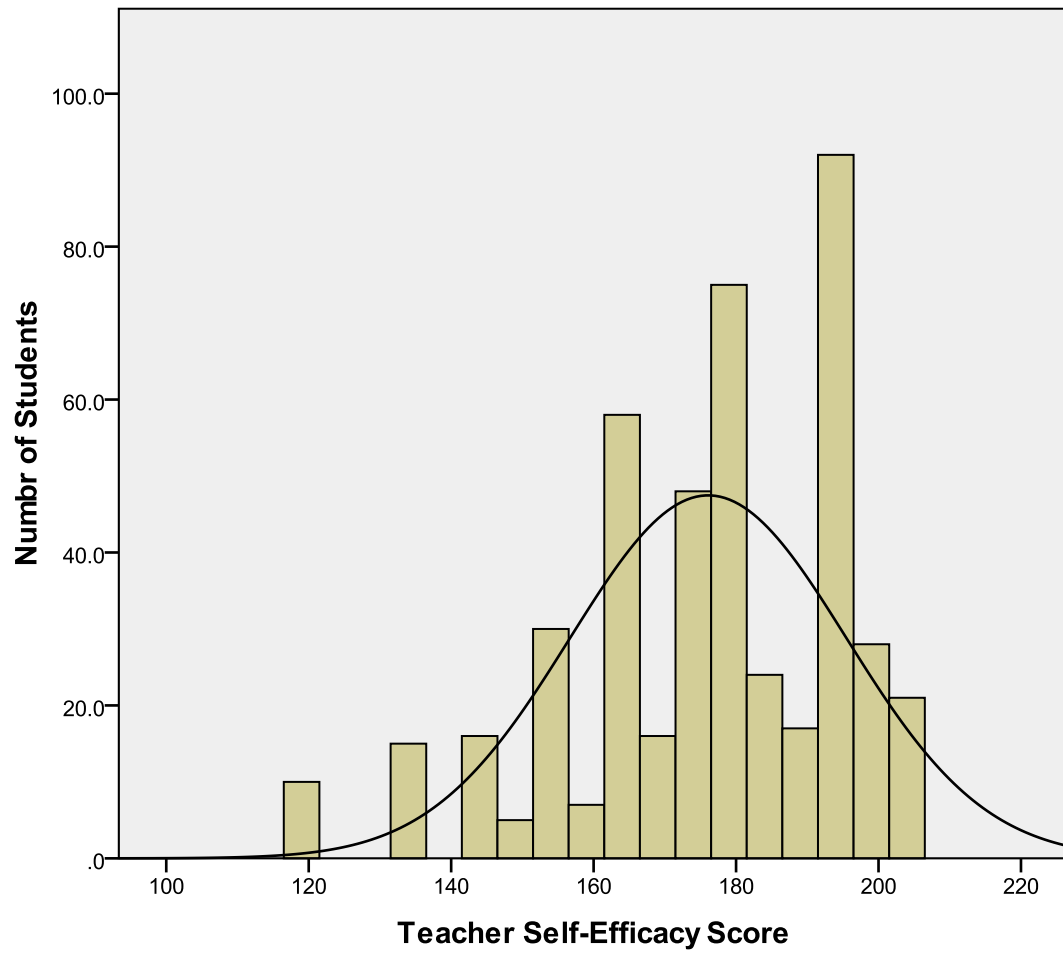


Figure D5. Distribution of TSES scores over students. $N = 462$, $M = 176.09(19.39)$

Appendix E

TSES Factor Analysis Comparisons

Table E1

Comparison of Factor Loadings on the TSES with Tschannen-Moran and Hoy's Validation Studies

	Loading ^a	T-M & H
Factor 1: Efficacy for instructional strategies		
1. craft good questions for your students	0.72	0.68
2. implement alternative strategies in your classroom	0.70	0.66
3. use a variety of assessment strategies	0.69	0.72
4. adjust your lessons to the proper level for individual students	0.60	0.59
5. provide appropriate challenges for very capable students	0.55	0.55
6. provide an alternative explanation when students are confused	0.49	0.70
7. gauge student comprehension of what you have taught	0.34	0.57
8. respond to difficult questions from your students	0.35	0.66
Factor 2: Efficacy for classroom management		
1. respond to defiant students	0.76	0.61
2. calm student who is disruptive or noisy	0.72	0.66
3. establish a classroom management system with students	0.69	0.66
4. keep a few problem students from ruining an entire lesson	0.66	0.62
5. get children to follow classroom rules	0.61	0.69
6. make your expectations clear about student behavior	0.59	0.53
7. controlling disruptive behavior in the classroom	0.54	0.78
8. establish routines to keep activities running smoothly	0.46	0.50
Factor 3: Efficacy for student engagement		
1. motivate students who show low interest in schoolwork	0.83	0.66
2. getting through to the most difficult students	0.71	0.47
3. get students to believe they can do well in schoolwork	0.70	0.75
4. help your students value learning	0.66	0.70
5. helping your students think critically	0.65	0.56
6. improve the understanding of a student who is failing	0.65	0.57
7. assist families in helping their children do well in school	0.63	0.63
8. foster student creativity	0.47	0.50

^aExtraction Method: Principal Axis Factoring with Varimax Rotation

Appendix E, continued

Table E2

Comparison of Eigen Values on the TSES with Tschannen-Moran and Hoy's Validation Studies

Factor	This Study		T-M & H	
	Eigen values	Cum %	Eigen values	Cum %
Instructional strategies	9.58	39.91	10.38	43.25
Classroom management	2.59	50.70	2.03	51.72
Student engagement	1.77	58.06	1.62	58.47

Appendix F

Interaction Statistics

Table F1

Results for Variables When Used as an Interaction Term with Disability

Variable * Disability	<i>df</i>		<i>F</i>	<i>p</i>
	Numerator	Denominator		
Gender	4	431.888	.420	.794
SES	4	420.536	.429	.788
Ethnicity	4	430.552	.330	.858
College Selectivity	9	411.804	.643	.760
License Type	2	423.352	.217	.805
License Area	11	405.840	.705	.735

Table F2

p values for Univariate Tests on the Simple Effects of Each Variable Within Each Level Combination of Disability

	CD	ED	LD	OHI	LI
Gender	.670	.919	.421	.149	.785
SES	.495	.911	.245	.094	.507
Ethnicity	.895	.373	.465	.745	.871
College Selectivity	.858	.429	.015	.085	.931
License Type	.356	--	.447	--	.837
License Area	.414	.705	.762	.503	.896

Appendix G

Comparison of Significance of Fixed Effects with Experience as a Categorical and Continuous Variable

Source	<i>p</i>	
	Categorical	Continuous
Intercept	.376	.167
Gender	.210	.243
SES	.102	.077
License Area	.400	.773
College Selectivity	.021	.014
License Type	.426	.402
Disability	.004	.005
Ethnicity	.629	.676
Coursework	.075	.064
TSES	.634	.519
NCE_2006	.000	.000
Experience	.639	.460

Appendix H

Statistics for Disability as a Dichotomous Variable (With/Without CD)

Table H1

Fixed Effects When Disability is With/Without CD

Source	<i>df</i>		<i>F</i>	<i>p</i>
	Numerator	Denominator		
Intercept	1	185.288	.020	.887
CD	1	423.310	5.370	.021
College Selectivity	3	84.616	.448	.719
NCE_2006	1	449.758	216.551	.000
CD * College Selectivity	3	427.872	.676	.567

Table H2

Estimates of Covariance Parameters When Disability is With/Without CD

Parameter	Estimate	<i>SE</i>	Wald <i>Z</i>	<i>p</i>
Residual	141.729	10.054	14.097	.000
Reading Teacher	23.586	9.126	2.585	.010

Table H3

Univariate Tests on the Simple Effects of College Selectivity Within Each Level Combination of Disability

Disability	<i>df</i>		<i>F</i>	<i>p</i>
	Numerator	Denominator		
All others	3	45.453	3.354	.027
CD	3	280.379	.170	.917

Appendix I

Estimated Means of Reading Gain for Disability Groups by Teacher License Area

Disability	License Area	<i>M</i>	<i>SE</i>	<i>df</i>
CD	MM	-2.143 ^a	3.646	137.924
	CD	-3.397 ^a	5.877	174.584
	LD	2.725 ^a	4.466	161.762
	CD & LD	-5.849 ^a	3.845	131.034
ED	MM	6.922 ^a	6.562	61.332
	CD	^b	.	.
	LD	-.036 ^a	5.783	305.630
	CD & LD	3.119 ^a	12.522	426.564
LD	MM	5.231 ^a	2.505	41.450
	CD	3.547 ^a	3.754	45.303
	LD	2.337 ^a	2.949	44.864
	CD & LD	1.936 ^a	2.923	47.436
OHI	MM	2.690 ^a	4.457	236.240
	CD	14.161 ^a	7.854	312.744
	LD	2.323 ^a	4.692	186.708
	CD & LD	1.575 ^a	4.197	175.877
LI	MM	6.307 ^a	6.013	373.793
	CD	8.530 ^a	6.283	237.084
	LD	10.998 ^a	5.460	273.634
	CD & LD	12.269 ^a	6.778	368.732

^aCovariates appearing in the model are evaluated at the following values: NCE_2006 = .1717, Coursework = 22.51, TSES = 176.09, Experience = 14.43.

^bThis level combination of factors is not observed, thus the corresponding population marginal mean is not estimable.

VITA

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Indiana University
201 N. Rose Ave
Bloomington, IN 47405
(812) 856-8162

EDUCATION:

Ph. D., Special Education, April 2010
Indiana University

M.S. Ed., Special Education, 1980
Wright State University, Dayton, OH

B.S. Ed., Psychology, *cum laude* 1975
Cumberland College, Williamsburg, KY

TEACHING CREDENTIALS:

Administrative:

Superintendent, High School Principal, and Elementary Principal (OH) –
Professional License, 2008-2013
Educational Administrative Specialist: Education of Exceptional
Pupils (OH) – Permanent
Director of Pupil Personnel (KY) – Lifetime
Secondary School Principal (KY) – Lifetime

Teaching:

EMR & MSPR, K-12 (OH) – Permanent
Psychology & Biology, 7-12 (OH) – Professional License, 2008-2013
High School Psychology & Biology (KY) – Lifetime
EMR & TMR (KY) – Lifetime

PROFESSIONAL EXPERIENCE:

Teaching

2009-2010: Clinical Lecturer, Indiana University

Director of Secondary Transition to Teaching
S555, Diversity and Communities of All Learners
K371, Assessment and Individualized Instruction in Math and Reading

2008-2009: Visiting Faculty Member, Indiana University
K306, Educating Students with Mild Disabilities in Secondary Classrooms
K371, Assessment and Individualized Instruction in Math and Reading

2005-2008: Associate Instructor for Indiana University
K306, Educating Students with Mild Disabilities in Secondary Classrooms
K522, Teaching Social Skills
K344, Education of the Socially and Emotionally Disturbed II
K371, Assessment and Individualized Instruction in Math and Reading
K495A, Field Experience in Special Education
K495B, Field Experience in Urban Education

2002-2005: Adjunct Professor for University of Dayton
EDT577, Career Education for Special Education

1977-1980: Shelby County Board of Mental Retardation and Developmental Disabilities
Instructed adults with moderate and severe disabilities in a sheltered workshop setting

1975-1977: Felicity Franklin Schools
Taught students in grades six through nine with developmental disabilities in a self-contained classroom

Administrative

2000-2005: Piqua City Schools
Assistant Superintendent – responsible for all special education programs, managed annual budget of \$2.1 million in state & federal grants and recruited and selected professional personnel

1999-2000: Sidney City Schools
Director of Personnel – responsible for recruitment and retention of all personnel

- 1995-1999: Sidney City Schools
Director of Pupil Services – *responsible for special education programs, supervision of all ancillary student services including transportation*
- 1984-1995: Sidney City Schools
Director of Special Education/Elementary Principal – *supervised district-wide special education program while acting as principal of a small elementary school*
- 1980-1984: Sidney City Schools
Director of Special Education/Career Education – *supervised district's special education program and the career education program*

RESEARCH ACTIVITIES:

Principal Investigator, Evaluation of Energy Express 2009 summer reading program. Funded by the West Virginia Commission for National and Community Service (2009)

Principal Investigator, Evaluation of Energy Express 2008 summer reading program. Funded by the West Virginia Commission for National and Community Service (2008)

Research Assistant, Special Education Delivery System Year 3 Study, Center for Evaluation and Education Policy, Indiana University. Funded by Indiana Department of Education (2007)

Research Assistant, Special Education Delivery System Year 2 Study, Center for Evaluation and Education Policy, Indiana University. Funded by Indiana Department of Education (2006)

Action Research:

The Effect of Inclusion on Performance of Students with Disabilities in Piqua City Schools (2003)

Report on the Effectiveness of the CCC Software Program in Grades 1, 2, 3, 4 for Piqua City Schools (2002)

Is CCC preparing our students for the 4th grade proficiency test? (1999)

Dropouts at Sidney High School: Who are they and how has Team 9 made a difference? (1996)

PUBLICATIONS:

- Edmonds, B. & Spradlin, T. (2009). *What does it take to become a high performing special education planning district? A study of Indiana's special education service delivery system*. Remedial and Special Education OnlineFirst, doi:10.1177/0741932508327451.
- Plucker, J., Spradlin, T., Hansen, J., Michael, B., Jackson, R., Macey, E. & Edmonds, B. (2008). *Special education service delivery in Indiana: Year 3 study*. Bloomington, IN: Indiana University Center for Evaluation and Education Policy.
- Plucker, J., Spradlin, T., Toutkoushian, R., Michael, B., Hansen, J., Zapf, J. et al. (2007). Special education service delivery in Indiana. *Education Policy Brief, (5) 4*, 1-7.
- Plucker, J., Spradlin, T., Toutkoushian, R., Michael, B., Hansen, J., Zapf, J. et al. (2007). *Special education service delivery in Indiana: Year 2 study*. Bloomington, IN: Indiana University Center for Evaluation and Education Policy.
- Anderson, S. L., Sakalli-Gumus, S. & Edmonds, B. (2006). Teacher behaviors and adolescent girls who are at risk. *Essays in Education, 16*.

GRANTS:

- 2004 Special Education Access Grant (\$16,500)
- 2001 Baldrige in Education Grant for School District Deployment (\$25,000)
- 2001 Continuous Improvement Grant (\$18,000)
- 1999 Martha Holden Jennings Foundation Grant awarded for: Promoting Literacy (\$3,195)

PROFESSIONAL PRESENTATIONS

- Edmonds, B. (2010, January) *Teacher Characteristics and the achievement of Students with Disabilities*. A paper presented at the Special Education Research Seminar, Bloomington, IN.
- Wall-Marencik, W., Edmonds, B., & Butera, G. (2009, July). *Preparing Doctoral Students in Special Education for the Professorate in a Time of Urgency*. A paper presented at the International

Association for Special Education Annual conference in Alicante, Spain.

Wall-Marencik, W., Edmonds, B., & Butera, G. (2008, November). *Preparing Doctoral Students in Special Education for the Professorate in a Time of Urgency*. A paper presented at CEC Teacher Education Division Annual Conference, Dallas, TX.

Yang, K.-J. & Edmonds, B. (2008, January). *Different approaches to engaging low-track students in learning mathematics*. A paper presented at the Hawaii International Conference on Education, Honolulu, HI.

Butera, G., Cousik, R., Dollarhide, J., Edmonds, B., Korzekwa, P., Stone-MacDonald, A. et al. (2007, November). *Towards an improved teacher education program: Working with pre-service teachers, universities, and K-12 schools*. A poster presented at CEC Teacher Education Division Annual Conference, Milwaukee, WI.

Edmonds, B. (2006, October). *Are the rights of preschoolers at risk of disabilities being violated?* A poster presented at CEC Division of Early Childhood Annual Conference, Little Rock, AR.

Janson, D., Edmonds, B., Heidenreich, E., & Savage, G. (2005, June). *Using the power of technology and assessment data to drive curriculum alignment*. Reach for Success 2005 Conference, Cincinnati, OH.

SERVICE ACTIVITIES

2008-2009	Faculty Representative from the Teaching All Learners program to the University Division and Residential Programs and Services collaborative student outreach program
2007-2008	Search committee for Otting Endowed Chair for Special Education
2007-2008	Student Ambassador for the Special Education doctoral program
2005-2009	Committee on Teacher Education, Indiana University
2003-2007	NCATE Graduate Advisory Committee for Urbana University in Urbana, OH
2000-2005	Miami County Special Education Consortium board

- 2000-2005 Miami County Special Education Finance Committee
- 1992-1999 Shelby County Special Education Task Force formed to integrate students with moderate to severe disabilities into the public schools (charter member)
- 1990-1999 Assistive Technology Committee of the West Central Special Education Regional Resource Center (charter member)
- 1982-1999 Shelby County Cluster for Youth
- 1980-1999 West Central Special Education Regional Resource Center governing board
- 1984-1990 Shelby County Residential Services Board for adults with developmental disabilities
- 1988 Focus group member for the State Superintendent's Vision for Special Education

PROFESSIONAL ASSOCIATIONS:

- American Educational Research Association (AERA)
- Council for Exceptional Children (CEC)
Division of Teacher Education
- Phi Delta Kappa